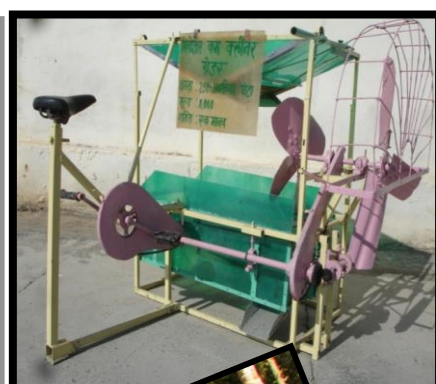
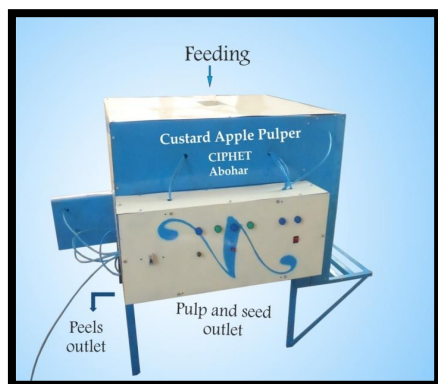


# TECHNOLOGIES MACHINERY AND GADGETS DEVELOPED BY ICAR INSTITUTES FOR POST -HARVEST PROCESSING PRESERVATION AND VALUE ADDITION OF AGRICULTURAL PRODUCE



**Agricultural Engineering Division  
Indian Council of Agricultural Research  
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VISIT...

LANZAROTE  
*Caliente*.COM

**Some Important Technologies Missionary and Gradgets Developed by ICAR  
Institute for Post Harvest processing, Preservation and Value Addition of  
Agriculture Produce**

1. CIPHET-Pomegranate Aril Extractor
2. Litchi Peeler
3. Custard Apple Pulper
4. Makhana popping machine
5. Evaporative Cooled structure
6. CIPHET- Banana comb Cutter
7. Low cost fish descaling hand tool
8. Dried Onion Flakes and Powder
9. Process for making green chilli puree and powder
10. Battery operated live fish carrier
11. Pedal cum power operated cleaner cum grader
12. Millet mill
13. Continuous feed aloevera whole gel extraction equipment
14. Technology package for soymilk and tofu
15. Granular Jaggerybcompressed cubes
16. Process and machinery for preparation of granular jaggery
17. ANGRAU Turmeric Polisher
18. Turmeric Steam Boiler
19. Mini vegetable Oil refining unit
20. Portable evaporatively cooled vegetable display cabinet
21. ICAR TANUVAS electrical stunner
22. Japanese quail feed incorporating slaughter house by products
23. Insect trap
24. Biomass heat generated dryer
25. Multi fruit grader (Manual)
26. Solar-biomass integrated drying system for spice crops.
27. Black pepper seed powder as grain protectant @ 3 g / kg of grain for safe storage of green gram.
28. Complete package of technology for production of coconut chips
29. Complete package of technology for the production of virgin coconut oil (VCO)
30. Manually operated grain puffing machine
31. Sugarcane Juice Filtration System
32. Liquid Jaggery Production Process
33. Three pan furnace for jaggery making
34. Jaggery drying-cum-storage godowin
35. Process for production of fish ham and patty
36. Process for fish snacks using hybrid solar biomass powered dryer
37. Process for making pet treats from buffalo slaughter house by-products
38. Preparation of fermented pork products (Sausage/Salami)
39. Maize primary processing
40. Fish Deboner

41. Solar Tunnel/multi-mode drier for grapes, chilli, fig, onion, fish
42. Methionine producing probiotic poultry feed supplement
43. Development of osmo-dried destoned apricot
44. Development of osmo-dried sand pear:-analog of Petha
45. Apple corer and apple seed extractor
46. Walnut grader
47. MAP of edible wax coated passion fruit:
48. Development of extruded RTE snack food from starch based food products.
49. Development of thermally processed jackfruit
50. Process technology for garlic flakes and powder
51. Shrink wrap packaging of fruits and vegetables (Kinnow, capsicum and tomato)
52. VL Paddy Thresher with plastics components
53. Plastic Maize Sheller
54. Development of multitier multipurpose polyhouse for drying of produce and raising of crop nursery/small height crop
55. Reduction of transportation losses for delicate fruits and vegetables (sapota and tomato)
56. Modified atmosphere packaging (MAP) for sapota and mango
57. Low cost plastic ripening chamber for ripening of mango
58. Portable low cost solar multi tier poly tunnel dryer for fruits and vegetables
59. Utility of plastics in handling, packaging and transportation of custard apples
60. Guava harvesting package
61. Manual ragi thresher-cum-pearler
62. Women friendly paddy thresher with safety cover
63. Gravity based rope way for carrying agricultural produce in hilly terrain
64. Pedal and power operated arecanutdehusker
65. Manually operated arecanutscrarifier
66. Hand protection devices (gloves) to be used during fish dressing
67. Dust free technology for traditional rice mills

## **POST HARVEST TECHNOLOGIES**

### **CIPHET-Pomegranate Aril Extractor**

The system comprises the essential components such as Pomegranate Fruit Breaking unit, Drive unit, Collection Trays where separated arils and extraneous matters are received, Vibrating Sieve unit; and the clean arils and extraneous matter Collection Troughs. The fruit breaking unit consists of innovative mechanisms with knives arrangement to continuously break the fruit in such a way that the major portion (85-90%) of arils is safely separated out from the broken peels. The rest of the arils that is about 10-15% remains attached with the peels are further getting separated over the vibrating screen designed specifically for this purpose. The machine is capable to process the whole pomegranate at a rate of approximately 30-35 fruits per minute with extraction capacity of 90-94% and with little damage of arils that is about 2-4%.

### **Specifications of the Pomegranate Aril Extractor:**

|                                        |                                                |
|----------------------------------------|------------------------------------------------|
| Capacity                               | 500Kg/h (approximately 35-40 fruit per minute) |
| Weight                                 | Around 150 kg                                  |
| Dimensions                             | 1.5x0.7x1.6 m                                  |
| Material of Make                       | Stainless Steel                                |
| Current cost of one unit               | Rs.6 lakhs                                     |
| For further information please contact | Director, ICAR-CIPHET, Ludhiana                |



### **Litchi Peeler**

The machine consists of two stainless steel rollers rotating at differential speed in opposite direction towards each other. Stainless steel spikes are placed on one roller where as the other roller has knurled surface. The litchi fruit moves between the curved surfaces formed between the rollers. During this movement, the largest dimension of fruits is aligned in the direction of inclination of rollers and conveyed towards the spikes mounted on the rollers. Since the fruit remains in contact with rollers, it starts rotating. As the fruit approaches to the spikes, it pierces the peel of fruit. Due to circular motion of the fruit, the spike makes a cut on the peel. The knurling of the other roller restricts the movement of the fruit due to friction. The peel opens from the cut made on peel and due to shear developed by differential speed; the peel is separated from the fruit. The peel passes through the rollers and goes down. The moving belt provided at the top of the rollers produces compression in this process to generate sufficient friction and shear and to avoid jumping of fruit. The designed peeling machine can be operated by using 1.0 hp electric motor. The optimum peeling efficiency of the machine was about 96% with less than 4% loss of pulp. The developed peeler is beneficial because

### **Specifications of the Automatic Litchi Peeler:**

|                                        |                                 |
|----------------------------------------|---------------------------------|
| Capacity                               | 120 kg/h                        |
| Weight                                 | Around 100 kg                   |
| Dimensions                             | 1.5x1.5x2 m                     |
| Material of Make                       | MS Sheets and Stainless steel   |
| Current cost of one unit               | Rs.3 lakhs                      |
| For further information please contact | Director, ICAR-CIPHET, Ludhiana |

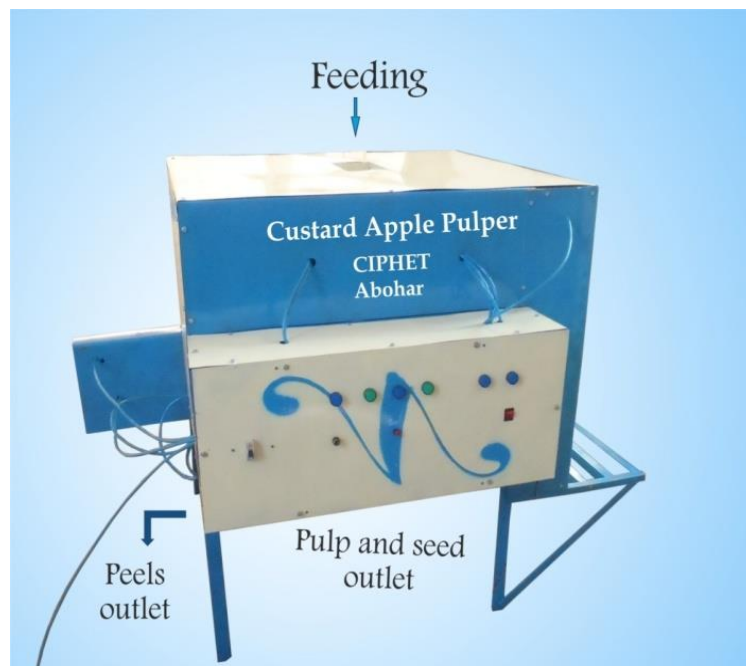


### **Custard Apple Pulper**

Custard apple is an underutilized crop cultivated in more than 40,000 hectares in Andhra Pradesh, 35,000 hectares in Maharashtra, 20,000 hectares in Karnataka and 20,000 hectares in Rajasthan. Mostly custard apple fruit cultivation is in the form of unorganized farming. Due to unavailability of handling and processing machineries related with this fruit, it is being underutilized. This invention brings higher value for the fruits thus leads to get good income for the farmers. The custard apple pulper contains three mechanism viz. fruit cutting mechanism, fruit scooping mechanism and pulping mechanism. Fruit cutting and scooping mechanism are made with pneumatic actuators and electronic controls. This invention is fully automatic machine assisted with pneumatic power and electronically controlled. The efficiency of the cutting and scooping mechanism: 94% pulp recovery, 6% pulp wastage along with peels.

### **Specifications of the Automatic Custard Apple Pulper:**

|                                        |                                 |
|----------------------------------------|---------------------------------|
| Capacity                               | 120 kg/h                        |
| Weight                                 | Around 120 kg                   |
| Dimensions                             | 1.5x1.5x2 m                     |
| Material of Make                       | MS Sheets and Stainless steel   |
| Current cost of one unit               | Rs.3 lakhs                      |
| For further information please contact | Director, ICAR-CIPHET, Ludhiana |





## Makhana popping machine

Makhana is a popped kernel of seeds of an aquatic fruit called gorgon nut (*Eurya ferox*). It is considered to be a highly nutritious dry fruit grown mainly in Bihar, Assam, some parts of Up, West Bengal, Tripura, J&K, etc. The newly developed makhana popping machine is able to roast and pop the kernel at about 35-40 kg raw wet seeds per hour and produce high amount of grade I popped kernel. It has replaced manual roasting and popping operations. The machine consists of a hopper, screw conveyor type roaster (having two continuous barrels of 1m length, one roaster is heated with thermic oil (3kW) and other roaster by mounting three band heaters of 3kW). The screw is rotated by belt pulley drive with motor of 0.5 to 1hp power. The residence time of roasting in barrel is controlled by controlling the speed of belt and pulley drive. Working temperature of both roasters varies between 200-340°C. Power supply to all heaters should be controlled through individual switches. Temperature of both roasters should be controlled using good quality temperature controller cum indicators. Speed of the screw conveyor should vary between 10-50 RPM. The developed makhana popping machine has decortication efficiency of 95% along with popping efficiency of 90-94%.

### Specifications of the Makhana popping machine:

|                                        |                                 |
|----------------------------------------|---------------------------------|
| Capacity                               | 35-40 kg raw wet seeds per hour |
| Weight                                 | Around 250 kg                   |
| Dimensions                             | 2x1.5x2.5m                      |
| Material of Make                       | Mild steel                      |
| Current cost of one unit               | Rs.3.5 lakhs                    |
| For further information please contact | Director, ICAR-CIPHET, Ludhiana |





## Evaporative Cooled structure

Evaporative Cooled Structure (ECS), which maintains high relative humidity and moderately low temperature to maintain the quality during storage of fresh fruits and vegetables, is suitable for such circumstances. The ECS is also environment friendly as it saves energy. This EC structure requires little energy to run a fan and water circulation motor, and has less initial investment and low cost of maintenance. It maintains a moderate low temperature and sufficiently high relative humidity for short term storage of fresh fruits and vegetables. Special features include special design of roof. Orientation uses wetted pad as cooling medium.

### Specifications of the Evaporative Cooled structure:

|                                        |                                  |
|----------------------------------------|----------------------------------|
| Capacity                               | 2 to 5 tons (Storage capacity)   |
| Weight                                 | Not applicable                   |
| Dimensions                             | 5x5x3 m                          |
| Material of Make                       | Bricks                           |
| Current cost of one unit               | Rs.2-4 lakhs (Construction cost) |
| For further information please contact | Director, ICAR-CIPHET, Ludhiana  |



### **CIPHET- Banana comb Cutter**

This simple tool is suitable for all sizes of banana bunch stem and manually placing the tool and putting little pressure from top achieves cutting. CIPHET Banana-Comb/hand Cutter maintains smooth cutting curve of banana-comb/hand, with no fruit damage during cutting (as in case of knife or sickle cutting, some banana-finger getting damaged). This tool is suitable for all sizes of banana bunch stems. One person is required to perform the banana-comb/hand cutting activity with less stress.

#### **Specifications of Banana comb Cutter:**

|                                        |                                 |
|----------------------------------------|---------------------------------|
| Capacity                               | 120-150 bunches/ h              |
| Weight                                 | 450g                            |
| Dimensions                             | 30x10x10cm                      |
| Material of Make                       | Mild steel                      |
| Current cost of one unit               | Rs.150                          |
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### **Low cost fish descaling hand tool**

The fish descaling hand tool reduces drudgery in descaling operation and also reduces the time required in descaling from 120 s to 40 s for descaling of average 500 g fish vis a vis traditional hand tool in practice. The 99 % descaling efficiency is achieved. The fish descaling tool has several advantages over existing practice of descaling where the traditional hand tool or knives were in vogue. It reduces drudgery, has higher capacity of descaling per unit time, no injury to operator, descaling in standing condition also leads proper posture in descaling operation. Injury free operation will lead to occupational safety and wellbeing of fish retailers.

#### **Specifications of fish descaling hand tool:**

|                                        |                                   |
|----------------------------------------|-----------------------------------|
| Capacity                               | 40s for single fish               |
| Weight                                 | 400 g                             |
| Dimensions                             | 13.5x6x5.5cm                      |
| Material of Make                       | Plastic pad with mild steel teeth |
| Current cost of one unit               | Rs.1500                           |
| For further information please contact | Director, ICAR-CIPHET, Ludhiana   |



### **Dried Onion Flakes and Powder**

Fresh onion has about 86% of moisture content and TSS of 12-13°Brix. 100 kg of onion will yield about 14-16 kg of dried onion flakes and these can be rehydrated in water for 30 min before consumption to get 5-6 times of rehydrated onions. Onion flakes can be converted into powder for utilization in the different product preparations by using pulverizers/mixer/grinder. A batch of 50Kg sliced onion takes about 8-9 hours drying time in tray drier and 16-18 sunshine hours in greenhouse drying.

#### **Specifications :**

|                                        |                                 |
|----------------------------------------|---------------------------------|
| Capacity                               | Not applicable                  |
| Weight                                 | Not applicable                  |
| Dimensions                             | Not applicable                  |
| Material of Make                       | Not applicable                  |
| Current cost of one unit               | Not applicable                  |
| For further information please contact | Director, ICAR-CIPHET, Ludhiana |



### Process for making green chilli puree and powder

The fresh green chilli is cleaned and destalked. The destalked green chilli is washed and removed the dust and dirt. Then the green chilli is blanched at 95°C for 4 minutes for enzymatic deactivation. The blanched green chilli is thus crushed in rotary crusher for size reduction. The crushed chilli is subjected to pulping. The pasteurized pulp contained 16-18 % total solids is termed as green chilli puree. While the crushed green chilli is dried to 4% moisture content and pulverised. This powder is a fine product **named green chilli powder**.

#### Specifications :

|                                        |                                 |
|----------------------------------------|---------------------------------|
| Capacity                               | Not applicable                  |
| Weight                                 | Not applicable                  |
| Dimensions                             | Not applicable                  |
| Material of Make                       | Not applicable                  |
| Current cost of one unit               | Not applicable                  |
| For further information please contact | Director, ICAR-CIPHET, Ludhiana |





## Battery operated live fish carrier

Live fish carrier system has two major components Self-Aerating Containers (SAC) and Battery Operated Self-Contained Aerating Vehicle (BOSCAV). Self-Aerating Containers (SAC) are stackable, easy unloading and aerating containers with approximate capacity of 10-20 kg fish/container. SAC is equipped with aerators, filters and metabolite absorbent to maintain ideal water quality for fish during transportation. SAC facilitates easy loading and unloading of fish, transportation of individual fish species with specific size separately in the same vehicle and also minimizes accident proneness. BOSCAV is operated by rechargeable 4 Lead Acid batteries of 12 Volt 100 Amp. each, equipped with self-aerating system with a total carrying capacity of 500 kg. It can run about 60-80 km from a single charge. Driver's shed and control panel near driver seat provides single man handling facility

### Specifications of Battery operated live fish carrier:

|                                        |                                           |
|----------------------------------------|-------------------------------------------|
| Capacity                               | 500 kg                                    |
| Weight                                 | 1 ton (including vehicle)                 |
| Dimensions                             | 3x1.1x1.6m                                |
| Material of Make                       | Plastic containers with mild steel frames |
| Current cost of one unit               | 1.75 lakhs                                |
| For further information please contact | Director, ICAR-CIPHET, Ludhiana           |



### **Pedal cum power operated cleaner cum grader**

A pedal cum power operated cleaner cum grader was developed by ICAR-Central Institute of Agricultural Engineering, Bhopal. It is a pedal or 370 W single phase electric motor operated equipment to separate dust, dirt, stones, straw, chaff, etc and grade the cereals and pulses. It consists of main frame, hopper, feeding mechanism, sieve box, scalping and grading sieves, eccentric unit centrifugal blower, bicycle drive unit, etc.

#### **Specifications:**

|                          |   |                                                      |
|--------------------------|---|------------------------------------------------------|
| Capacity                 | : | 800kg/h (power operated)<br>350kg/h (pedal operated) |
| Cleaning efficiency      | : | 99%                                                  |
| Powersource              | : | 370W                                                 |
| Material of Make         | : | Mild steel                                           |
| Current cost of one unit | : | Rs. 20,000/-                                         |

#### **For further information, please contact:**

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## Millet mill

A millet mill was developed by ICAR-Central Institute of Agricultural Engineering, Bhopal. The millet mill is an eco-friendly and energy efficient continuous type. It has a capacity of 100 kg/h of millet grains at 10-12 % moisture content. It operates with 760 W single phase electric motor. It can process even a kilogram of millet grains in a single pass. The separation of the husk is simultaneous with the suction arrangement and cyclone separator. It is suitable for dehulling of all small millets viz., foxtail millet, little millet, kodo millet, proso millet and barnyard millets. It has provisions to adjust the clearance between the dehulling surfaces to suit the different sizes of small millets. The dehulling efficiency of the machine is about 95%. The machine costs about Rs. 50,000. The air and noise pollution is under control during its operation. To note, it does not require any hard labour and, therefore, is women friendly. This technology licensed to (i) Perfura Technologies (India) Private Limited, 7, Maruthamalai Gounder layout, Ramakrishnapuram, Ganapathy, Coimbatore-641006, TN, [www.perfura.com](http://www.perfura.com), (ii) M/s. AVM Engineering Industries, No 1/191, Vanniar Nagar, Meyyanur Main Road, Meyyanur, Salem-636004, TN and (iii) M/s. Valampuri Industries, 2, Thiyaagi Kumaran Street, PN Pudur, Coimbatore-641014, TN

### Specifications:

|                          |                                     |
|--------------------------|-------------------------------------|
| Capacity                 | : 100-110 kg/h                      |
| Weight                   | : 112 kg (excluding electric motor) |
| Dimensions               | : 860 x 842 x 1460 mm               |
| Material of make         | : Mild steel and carborundum        |
| Current cost of one unit | : Rs. 50,000/-                      |

### For further information, please contact:

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## **Continuous feed aloe vera whole gel extraction equipment**

A continuous feed aloe vera whole gel extraction equipment was developed by ICAR-Central Institute of Agricultural Engineering, Bhopal. It was developed to extract aloe vera whole gel. The aloe vera leaves after harvesting at an optimum stage are thoroughly washed to remove the extraneous material. The lower base, top and sides of the leaf are trimmed. The leaves are fed onto the conveyor of the continuous feed gel extraction equipment. The leaves pass through top and bottom pair of rubber pressure roller assembly which is driven by power source through a gear transmission mechanism, peeling both the top and bottom rinds in a single pass. Pulp of the gel is extracted undamaged. The saving in time and cost over conventional method is up to 70% and 50%, respectively.

### **Specifications:**

|                          |                                        |
|--------------------------|----------------------------------------|
| Capacity                 | : 200 - 225 kg/h (900 - 1000 leaves/h) |
| Weight                   | : 450 kg                               |
| Dimensions               | : 1900 x 800 x 1350 mm                 |
| Material of make         | : Stainless steel                      |
| Current cost of one unit | : Rs. 60,000                           |

### **For further information, please contact:**

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## Technology package for soymilk and tofu

A cottage scale technology package for soymilk and soy *paneer* (tofu) was developed by ICAR-Central Institute of Agricultural Engineering, Bhopal. It consists of a stainless steel fabricated set up covering steam generation unit, grinder cum cooker, filtration unit and *paneer* pressing device suitable for production of soymilk and soy *paneer* at cottage scale. This set up is useful in setting up of a cottage scale commercial production unit for production of soy milk and soy *paneer*. At ICAR – CIAE, this unit has been found useful in training of upcoming entrepreneurs who have further established such units in different parts of the country

### Specifications:

|                          |                                                                     |
|--------------------------|---------------------------------------------------------------------|
| Capacity                 | : 200 litres soymilk or 50kg soy <i>paneer</i> (Tofu) per day (08h) |
| Weight                   | : 200kg                                                             |
| Dimensions               | : 3000x3000x3000 mm                                                 |
| Material of make         | : Stainless steel                                                   |
| Current cost of one unit | : Rs. 1,80,000/- (Plant)                                            |

### For further information, please contact:

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### **Granular Jaggery Compressed Cubes**

Process technology for making Granular Jaggery Compressed Cubes to use as sweetener in beverages was developed by AICRP on Post-Harvest Engineering and Technology, Regional Agricultural Research Station, Anakapalli. Compressed Jaggery cubes contain sucrose, glucose, fructose, iron, calcium, potassium including Vitamin A and B.



At present, sugar is added as sweetener in the beverages. Also sugar in the form of cubes is available in the market and has high demanding product for star hotels and in flights. Using sugar as a sweetener is harmful to diabetic patients whose population ranges from 30 to 40% comprising of all age groups. Under this situation, compressed jaggery cubes could be used in beverages instead of sugar or artificial sweeteners.

### **Specifications of the Compressed Jaggery Cubes**

Weight : 300 mg  
Dimensions : Dia: 9.45 mm and thickness: 3.75 mm  
Material of Make : Granular Jaggery and edible binder

### **For further information please contact:**

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### **Process and machinery for preparation of granular jaggery**

A Crystal (<3.0mm jaggery) making unit consists of hemispherical drum of stainless steel (for holding thick hot jaggery syrup) having 275 mm radius, 400 mm width and 800 mm length and is provided with perforated guard at the top having 475 mm width and 845 mm length for allowing natural cooling. The drum is provided with a circular opening of 114 mm diameter at the centre of bottom for discharge of crystal jaggery. An iron shaft (1300 mm long) is placed laterally in the drum leaving a gap of 100mm and fixed with bearings for easy rotation with the help of a handle. A total of 33 blades (each of 8 mm thick and 100mm long) arranged in 3 rows on the shaft in zigzag manner for facilitating scrapping of hot thick jaggery syrup into crystal/crystal form. Crystal jaggery making machine further modified by keeping rectangular projections (of 30 mm width and 32 mm length) with sharp edges at the end of the blades and were welded for easy shearing of jaggery into crystal form. This machine is superior in terms of saving time and drudgery.



### **Specifications of the machine**

Capacity : 25 kg crystal jaggery/hour

Weight : 145 kg

Dimensions : Outer length-840mm, width, 600 mm and height 550 mm

Material of Make : MS&GI

Current cost of one unit: Rs. 30000/-

For further information please contact:

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## ANGRAU TURMERIC POLISHER

ANGRAU Turmeric Polisher was developed by AICRP on Post Harvest Engineering & Technology, FTEC, Bapatla Centre of Acharya N.G.Ranga Agricultural University. Polishing of dried turmeric rhizomes is done to remove outer corky surface to get smoother surface texture and appearance. Polishing is done in two stages : Primary polishing (at farmer level); Secondary processing (at trader level). Preliminary processing is done at farmer's level before it is transported to market or before it is sold to traders. ANGRAU Turmeric Polisher was designed and developed carrying it out preliminary as well as secondary polishing. The polisher consists of 88 cm diameter MS drum which rests on ball bearings at the two ends on rectangular stand. At one end a reduction gear is provided to decrease torque required to rotate. The drum mainly consists of two meshes wrapped one above the other. The inner mesh is made up of expanded wire (4 cm X 4 cm) and outer mesh is fabricated with woven wire with grid size 0.5 cm X 0.5 cm. The polisher is filled to  $\frac{3}{4}$ <sup>th</sup> of its capacity ie., 175 kg in motor operated variant and 75 kg in hand operated variant. The drum is rotated either manually or with 2 HP single phase motor at an average speed of 25-30 rpm. Generally polishing can be completed within 10-20 min depending upon degree of polishing.

### **Specifications of the machine : Two variants (Motor operated / Hand Operated)**

#### **Motor Operated Variant**

Capacity : 700 kg/ h  
Weight : 250 kg  
Dimensions : 88 cm dia MS drum; Inner mesh (4 cm x 4 cm) and outer mesh ( 0.5 cm x 0.5 cm).  
Material of Make : Cast Iron  
Current Cost of One Unit: Rs. 40,000 /- (Including 2 HP motor)

#### **Hand Operated Variant**

Capacity : 250 kg/ h  
Weight : 105 kg  
Dimensions : 70 cm dia MS drum; Inner mesh (4 cm X 4 cm) and outer mesh ( 0.5 cm X 0.5 cm).  
Material of Make : Cast Iron  
Current Cost of One Unit: Rs. 18,000 /-

For Further details please contact :

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**Motor Operated Turmeric Polisher**



**Hand Operated Turmeric Polisher**

## **Turmeric Steam Boiler**

Turmeric steam boiler consists of four drums each having a capacity of 125 kg of turmeric rhizomes per batch, a water tank, diesel burner, boiler, feed pump and a control panel for regulating water, pressure, and temperature. All the components are fixed on a tractor trolley to move the equipment from field to field. The water gets heated with diesel burner and the steam with a pressure of 2 kgf/cm<sup>2</sup> is sent to the drums. At a time the steam can be supplied to two drums, it takes 7 to 10 minutes to boil the rhizomes and the valves are changed to divert the steam into next two drums. In this way one ton rhizomes can be cooked in an hour.



### **Specifications of the machine**

|                           |   |                                                           |
|---------------------------|---|-----------------------------------------------------------|
| Capacity                  | : | 2 tons/h (cooked rhizomes) 300 kg/h (final dried produce) |
| Weight                    | : | -                                                         |
| Dimensions                | : | 4500 X 1800 X4500                                         |
| Material of Make          | : | MS&GI                                                     |
| Current cost of one unit: |   | Rs. 6.00 lakh                                             |

For further information please contact

#### **Dr. D. Bhasker Rao**

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Mobile: 0 93940 - 43908

## Mini Vegetable Oil Refining Unit

A mini oil refining unit was developed by AICRP on Post Harvest Engineering and Technology, OUAT, Bhubaneswar Centre. The unit is useful for farmers and small entrepreneurs involved in oil processing for minimal refining of vegetable oil to improve its quality and storability. This unit may be taken up as an entrepreneurship venture at rural sector to refine crude edible oil. The unit consists of (i) one open mild steel tank with conical bottom for degumming/neutralization, (ii) one closed oval tank for vacuum drying/bleaching and (iii) one filter for filtration of oil. A vacuum pump is attached to the closed tank for maintaining vacuum during drying and bleaching of the oil. All the units are installed in a frame and connected with pipelines and pump for circulation of oil to different units. Electrical immersion heaters are used in both the tanks for heating the oil and the temperature of the oil is controlled by digital temperature indicator-cum-controller. Manual stirring arrangement was provided in both the tanks by an agitator (slow speed) having paddle type blades which are pitched to lift the product for stirring of the oil during heating and uniform mixing of chemicals in the oil. The oil tanks are insulated with asbestos ropes to prevent the heat loss to the surrounding.



### Specifications of the machine

|                          |   |                   |
|--------------------------|---|-------------------|
| Capacity                 | : | 30 kg per batch   |
| Weight                   | : | 62 kg             |
| Dimensions               | : | 135 x 70 x 150 cm |
| Material of Make         | : | M.S. ,G.I.pipes   |
| Current cost of one unit | : | 50,000/-          |

For further information please contact :Dr. Manoj Kumar Panda, Research Engineer,  
AICRP on Post Harvest Engineering and  
Technology,  
College of Agricultural Engineering and  
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Bhubaneswar-751003.  
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E mail: phts.ouat@gmail.com

## Portable Evaporatively Cooled Vegetable Storage Cabinet

A portable evaporatively cooled vegetable storage cabinet was developed by AICRP on Post Harvest Engineering and Technology, OUAT, Bhubaneswar Centre. The unit is useful for farmers and small vegetable vendors for short term storage of vegetables. A household cooler is modified to a portable evaporatively cooled retail storage chamber. Three sides of the unit are provided with khaskhas padding material and the door is made up of with perspex transparent sheet. A water collection tray is below the storage chamber and a small water pump (18 W) is connected to lift the water from the tray to the overhead tank placed above the chamber. The water is distributed throughout the padding material attached to the side walls of the storage unit. A small blower of 15 W is attached at the top for sucking of air to increase the cooling efficiency. The storage chamber is provided with three nos. perforated trays for storage of vegetables inside it. The unit provides suitable storage environment (4-5°C lower air temperature than ambient and 80-90% Relative humidity) which extends the shelf life of vegetable by 2-4 days. It is of low cost, portable and suitable for vegetable vendors who suffers economic loss due to rotting/drying/ripening loss. The unit can be manufactured by local cooler manufacturers or artisans.



### Specifications of the machine

|                          |   |                  |
|--------------------------|---|------------------|
| Capacity                 | : | 30 kg            |
| Weight                   | : | 28 kg            |
| Dimensions               | : | 75 x 72 x 132 cm |
| Material of Make         | : | M.S.             |
| Current cost of one unit | : | 7,000/-          |

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College of Agricultural Engineering and  
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## **ICAR TANUVAS Electrical Stunner**

TANUVAS ICAR Electrical Stunner was developed by the Department of Meat Science and Technology, Madras Veterinary College, under the AICRP on Post Harvest Engineering Technology.

The electrical stunner devised basically consists of a step down transformer and is capable of delivering up to 110 volts. Stunning is a process in which the food animals intended for slaughter are made unconscious prior to sticking, so that the animals may not feel the pain or agony of death. This is considered as a humane method of slaughter. Electrical stunning produces massive depolarisation of the neurons and thus renders the stunned animal insensible to pain. It is suitable for stunning pigs, sheep, goats, turkeys, emus and ostriches. The model has been so designed that a single unit is adaptable to the various species mentioned above and is also economical than commercially available electrical stunners. Further, this equipment has provision to automatically set the timing and voltage delivered.

### **Specifications of the machine**

|                           |   |                                               |
|---------------------------|---|-----------------------------------------------|
| Capacity                  | : | 15 Pigs per hour or 30 Sheep or Goat per hour |
| Weight                    | : | 28.5 Kg                                       |
| Dimensions                | : | 50 x 30 x 50 cms( l x b x h)                  |
| Material of Make          | : | Stainless steel                               |
| Current cost of one unit: |   | 42,000/-                                      |

For further information please contact

**Dr.Robinson.J.J.Abraham, Ph.D.,**

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ELECTRICAL STUNNER WITH TIMER



### **Japanese quail feed incorporating slaughterhouse by-products**

Japanese quail feed incorporating slaughterhouse by-products was developed by the Department of Meat Science and Technology, Madras Veterinary College, under the AICRP on Post Harvest Engineering Technology.

Japanese quail feed incorporating slaughterhouse by-products was developed to economise the production of Japanese quail feed and profitably make use of two important and abundantly available slaughterhouse by-products, namely rumen content and blood. Rumen content collected is drained and subsequently squeezed through 0.1 mm of stainless steel sieve and the retentate further sun dried for seven days to a final moisture content of 8 to 9 % moisture. Blood is coagulated and the coagulum spread on a plastic sheet for sun drying to lower the moisture level approximately to 10-11%. The blood and rumen content were ground and mixed in 1: 3 ratio respectively to obtain dried blood rumen content. Replacement of soyabean meal to an extent of 30% with dried blood rumen content was found to be appropriate from the standpoint of enhancement in productivity.

### **Specifications of the machine**

*(The technology is in a process and thus specifications as required cannot be provided.) Feeding of Japanese quail feed incorporating slaughterhouse by-products resulted in a reduction of feed cost by Rs 4.59/- per bird.*

For further information please contact

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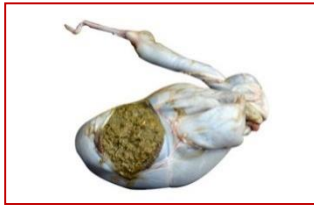
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## Processing of Dried Blood Rumen Content

**Rumen**

**Fresh Blood content**



**Fresh rumen content**

**Coagulated blood content**



**Removal of Rumen liquid**

**Dried Blood content**



**Dried Rumen content**

**Dried Blood and Rumen Content**



## **Insect Trap**

The basic characteristics of the stored product insects, viz., affinity towards air, tendency to move towards aerated region, wander in the grain and active during dusk and dawn have been exploited in the development of the trap. The stored grain insects, like red flour beetle, saw toothed beetle, rice weevil, paddy moth, turmeric beetle, drug beetle, pulse beetle, groundnut bruchid, dermestid beetles, flat grain beetles, etc with the behavior of wandering in the bulk grain, reach the insect trap. These insects enter the trap through the perforations and reach the stem of the trap. In the stem, as the insects cannot move upward and escape, they move towards the bottom and reach the pit fall placed at the bottom.



## **Specifications of the machine**

|                           |   |                                                 |
|---------------------------|---|-------------------------------------------------|
| Capacity                  | : | Suitable for storage bin holding up to 25-50 kg |
| Weight                    | : | NA                                              |
| Dimensions                | : | NA                                              |
| Material of Make          | : | Plastic                                         |
| Current cost of one unit: |   | Rs. 75/-                                        |

For further information please contact:

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Deptt, of Food and Agricultural Process Engg.

College of Agricultural Engineering

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Mobile: 0 94435 34273

### **Biomass heat generated dryer**

A Biomass heat generated dryer was developed by AICRP (PHET), CAU, Imphal. The machine operates on the principle of space heating, consists of a separate biomass combustion chamber/furnace and a drying chamber. The combustion chamber having overall dimension of 0.47 x 0.84 x 0.31 m comprises of two chambers separated by perforated grates/metal trays. The wood charcoal burns on the upper perforated grate whose oxygen for burning is supplied from the bottom grate through the holes. Two DC fans are fixed at the level of upper grate which assists in burning of the wood charcoals completely in the smokeless environment and forces the clean hot air flue gas into the rectangular ducts with the help of baffles. As the hot flue gas of temperature 150-200°C travels through the rectangular ducts of 0.84 x 0.84 m with a gap of 0.15 m, heat exchange through the walls of aluminum ducts take place. Thus, the space air surrounding the ducts gets heated up by natural convection and radiation. As the hot flue gas comes out through the other end, some of its heat is transferred to the aluminum pipes arranged horizontally through which the fresh drying is preheated. Then it is finally recirculated below the combustion chamber where it mixes with fresh air for burning of the wood charcoal thereby increasing the fuel burning efficiency. The temperature in the drying chamber attains upto around 60±5°C indicated by the digital temperature indicator and vapour mixed humid air escapes out through a separate chimney due to upward draft. The chimney having 0.125 m diameter and 1.5 m long is insulated with glass wool of 2.5 cm thick and is used to exhaust out the humid vapour. Thus sample bed is not exposed directly to hot flue gas. When the temperature in the drying chamber exceeds preset level, the damper fixed at the outlet of combustion chamber can be closed manually which cuts off the supply of hot flue gas into the channels. The capacity of the equipment is about 200kgs fresh sample per batch and drying takes about 9-10 hours to reduce the moisture content below 6-7% (w.b.).

### **Specifications of the machine**

|                           |   |                                                                                 |
|---------------------------|---|---------------------------------------------------------------------------------|
| Capacity                  | : | 200 kgs. per batch of drying                                                    |
| Weight                    | : | 30 kgs.                                                                         |
| Dimensions                | : | 2.4 (L) x 2.6 (B) x 1.25 m (H) and chimney height is 1.5 m and 0.125 m diameter |
| Material of Make          | : | Mild Steel and Aluminum sheet                                                   |
| Current cost of one unit: |   | Rs.1.0 (one) Lakh                                                               |

For further information please contact  
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**BIOMASS HEAT GENERATED DRYER**



### Multi Fruit Grader ( Manual)

The main component of multi fruit grader includes; feed trough, intermediate hopper, separating trough collecting platform and mainframe. Multi-fruit grader is designed on the principle of size basis and it is tested for guava, mosambi and orange. The multi-fruit grader is also an adjustable multi-fruit grader, which can be adjusted for a variety of spherical and oval shaped fruits. Multi-fruit grader can separate as small as 50mm size and as large as 130 mm fruits.



The moisture content of fresh fruits was determined as 78% in guava, 85% in mosambi and 89% in orange. Fruits were fed into the feed trough in batches. The position of baffles was decided on the basis of size of fruit and their rolling on that surface. Fruits were conveyed from feed trough to separating trough intermediate hopper, which is attached to the main frame. When the fruits were dropped in the separating trough they roll along with the length of separation trough due to the inclination. Separating trough is divided into four sections (i.e. 0-500, 500-1000, 1000-1500 and 1500-2000mm,) where fruit were separated into four grades (i.e. A: 50-70, B: 70-90, C: 90-110 and D: 110-130 mm.) Smaller fruits were separated out first while larger fruits rolled further and dropped according to their size in the larger opening provided for the purpose. Graded fruits were collected in the collecting boxes placed on collecting platform. Grading took place due movement under gravity over the variable opening slit and there is no need of any electrical or mechanical power.

### Specifications of the machine

|                           |   |                     |
|---------------------------|---|---------------------|
| Capacity                  | : | 1200 kg/h           |
| Weight                    | : | 63 kg               |
| Dimensions                | : | 2100 X 300 X 1650 m |
| Material of Make          | : | MS&GI               |
| Current cost of one unit: |   | Rs. 10000/-         |

For further information please contact

Dr Ravi Agrawal

College of Agricultural Engineering

Jawaharlal Nehru KrishiViswaVidyalaya

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**Solar-biomass integrated drying system for spice crops**

A Solar-biomass integrated drying system for spice crops was developed under AICRP on PHET at Assam Agricultural University, Jorhat, Assam. The dryer consists of a double parabolic solar concentrator accommodating 6 parabolic concentrators with equal spacing of 15 mm. The overall collector dimension is 2220 mm x 1230 mm with an inclination of 15° facing south (26.75° N and 94.22° E) for maximum exposure to insolation. To increase the effective drying time, manual solar tracking facilitated at 11.54° horizontal and 4.68° vertical respectively. A bio-waste fired assembly has a detachable grate type husk feeding system. The combustion chamber of length 1620 mm and diameter 450 mm has a horizontal grate for burning of solid biomass whenever required. The system is capable of producing air temperature between 44°C and 55°C with combination of solar and husk as source of energy. Woody biomass could produce 65 °C drying air temperature. Air flow and temperature control devices are incorporated at strategic locations. A wind turbine placed atop the drying chamber induces the required draught. The capacity of the dryer is for 100 kg per batch of sliced ginger/turmeric in 6 perforated trays. Total cost of the dryer is Rs.80,000/-. The overall energy utilization efficiency is 36.33%. A standard break-even analysis gave a value of 17.70 percent which reflected a high entrepreneurial possibility.

### **Specifications of the machine**

Capacity : 100 kg/batch  
 Weight : 500 kg  
 Dimensions : (L) 6080 mm x (B) 1670 mm x (H) 4200 mm  
 Material of Make : MS & SS  
 Current cost of one unit : Rs.80,000/-

For further information please contact

Dr. Abhijit Borah

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AICRP on PHET; Dept. of Agril. Engineering

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### **Solar-biomass integrated drying system for spice crops**

A Solar-biomass integrated drying system for spice crops was developed under AICRP on PHET at Assam Agricultural University, Jorhat, Assam. The dryer consists of a double parabolic solar concentrator accommodating 6 parabolic concentrators with equal spacing of 15 mm. The overall collector dimension is 2220 mm x 1230 mm with an inclination of 15° facing south (26.75° N and 94.22° E) for maximum exposure to insolation. To increase the effective drying time, manual solar tracking facilitated at 11.54° horizontal and 4.68° vertical respectively. A bio-waste fired assembly has a detachable grate type husk feeding system. The combustion chamber of length 1620 mm and diameter 450 mm has a horizontal grate for burning of solid biomass whenever required. The system is capable of producing air temperature between 44°C and 55°C with combination of solar and husk as source of energy. Woody biomass could produce 65 °C drying air temperature. Air flow and temperature control devices are incorporated at strategic locations. A wind turbine placed atop the drying chamber induces the required draught. The capacity of the dryer is for 100 kg per batch of sliced ginger/turmeric in 6 perforated trays. Total cost of the dryer is Rs.80,000/-. The overall energy utilization efficiency is 36.33%. A standard break-even analysis gave a value of 17.70 percent which reflected a high entrepreneurial possibility.

### **Specifications of the machine**

Capacity : 100 kg/batch  
Weight : 500 kg  
Dimensions : (L) 6080 mm x (B) 1670 mm x (H) 4200 mm  
Material of Make : MS & SS  
Current cost of one unit : Rs.80,000/-

For further information please contact

Dr. Abhijit Borah

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Email: [abhijit64@gmail.com](mailto:abhijit64@gmail.com) ; Ph: 0376- 2310115

### **Black pepper seed powder as grain protectant @ 3 g/kg of grain for safe storage of green gram**

A storage technology for safe storage of green gram has been developed by AAU Centre of AICRP on Post Harvest Engineering & Technology.

The harvested green gram is dried and the green gram is mixed thoroughly with black pepper seed powder @ 3 g/kg of grain and the treated green gram can be kept in plastic containers, jute bags with inner lining of polythene and also in metallic bins for a period of nine months without any damage by storage insect-pests.

#### **Specifications of the machine**

|                          |   |                                               |
|--------------------------|---|-----------------------------------------------|
| Capacity                 | : | NA                                            |
| Weight                   | : | NA                                            |
| Dimensions               | : | NA                                            |
| Material of Make         | : | Black pepper                                  |
| Current cost of one unit | : | Rs. 0.30 per gram of black pepper seed powder |

For further information please contact

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### **Complete package of technology for the production of coconut chips**

AICRP on PHET unit of ICAR-Kasaragod centre has developed a complete package of technology for the production of coconut chips by manual and mechanical methods. The machineries coconut dehusker, coconut desheller, testa remover, coconut slicer (manual and mechanical), blancher, dryer and packaging system for processing 250 coconuts per day have been designed and developed by ICAR-CPCRI. ICAR-CPCRI has so far commercialized and transferred this technology to 11 entrepreneurs.

#### **Specifications of the machine**

|                           |   |                   |
|---------------------------|---|-------------------|
| Capacity                  | : | 250 coconuts /day |
| Weight                    | : | NA                |
| Dimensions                | : | NA                |
| Material of Make          | : | Stainless steel   |
| Current cost of one unit: |   | Rs.6 lakhs        |

For further information please contact

#### **Dr.M.R.Manikantan**

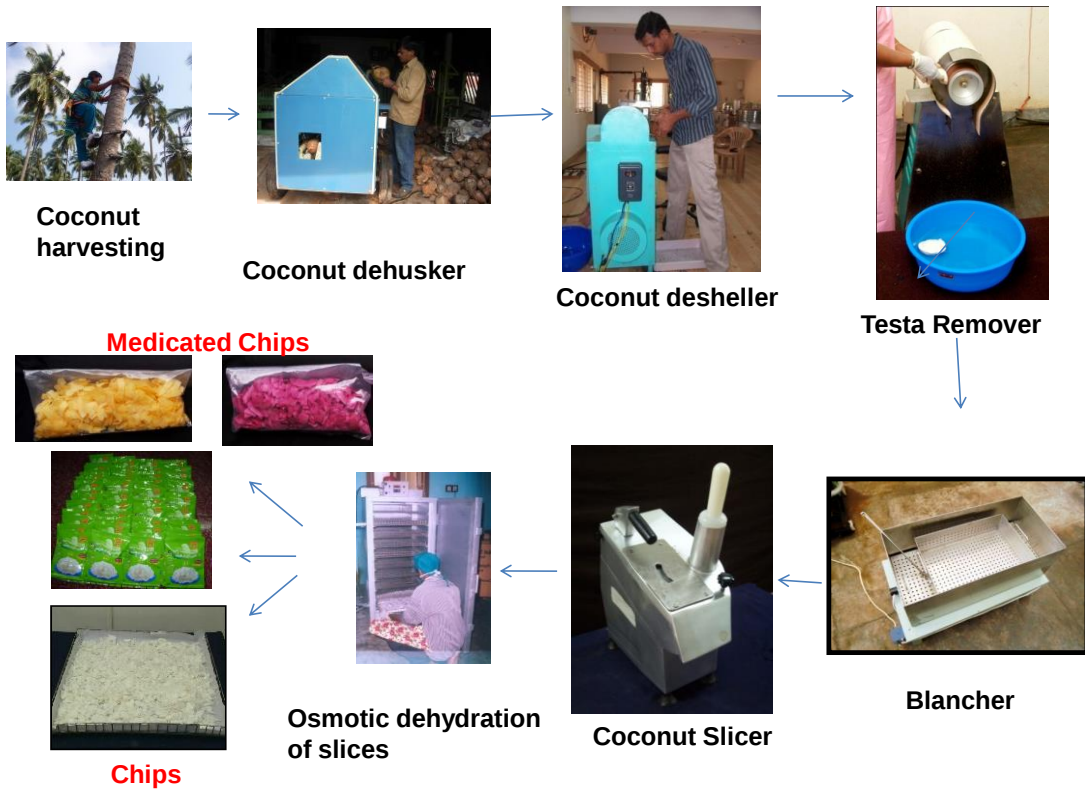
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### **Complete package of technology for the production of Virgin Coconut Oil (VCO)**

AICRP on PHET unit of ICAR-Kasaragod centre has developed a complete package of technology for the production of VCO by hot and fermentation process. The machineries coconut dehusker, coconut desheller, testa remover, pulverizer, coconut milk extractor (manual and mechanical), VCO cooker, dryer and filtration unit for processing 500 coconuts per day have been designed and developed by ICAR-CPCRI. ICAR-CPCRI has so far commercialized and transferred this technology to 19 entrepreneurs and five entrepreneurs have successfully undertaken production and business.

#### **Specifications of the machine**

Capacity : 500 coconuts /day

Weight : NA

Dimensions : NA

Material of Make : Stainless steel

Current cost of one unit: Rs.13 lakhs

For further information please contact

#### **Dr.M.R.Manikantan**

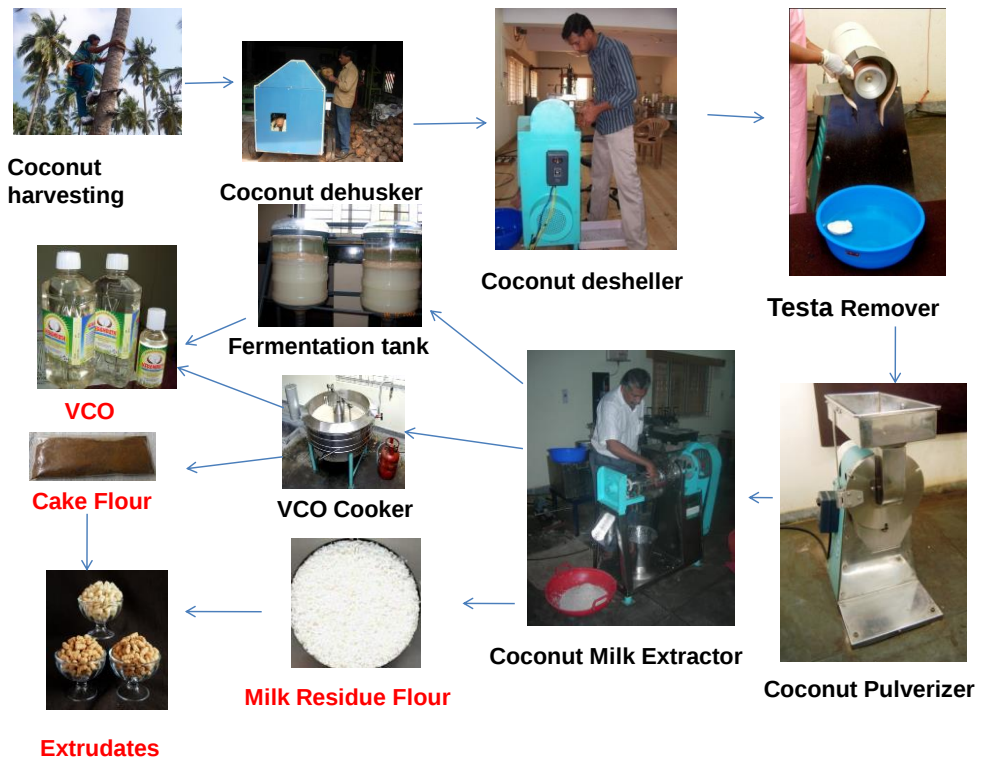
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### **Manually Operated Grain Puffing Machine**

A manually operated Grain Puffing Machine was developed by Indian Institute of Technology Kharagpur. The machine consists of a cylindrical container wherein the mixture of rice and sand is continuously agitated. An agitator is fitted to the bottom of the central shaft. The shaft is rotated by the handle. The conical bottom of the container has an opening so that the mixture of puffed rice and hot sand can be taken out by sliding the discharge gate. The machine may be fixed on some domestic furnace at a suitable height to suit the spout and its operation. A sieve is needed to separate sand from puffed rice. An extra attachment to cover the top of the container is also there to protect anything from dropping in or popping out. The sand is heated using agricultural waste and/or firewood.



#### **Specifications of the machine**

|                           |   |                                                                              |
|---------------------------|---|------------------------------------------------------------------------------|
| Capacity                  | : | 10 to 12 kg/h puffed rice                                                    |
| Weight                    | : | 10 kg (approx.)                                                              |
| Dimensions                | : | 30 cm (dia.) x 100 cm high (puffing cylinder; mounted on a supporting frame) |
| Material of Make:         |   | Mild steel                                                                   |
| Current cost of one unit: |   | Rs. 1500/-                                                                   |

#### **For further information please contact**

Dr. S.L. Shrivastava

Co-PI, AICRP on PHET (ICAR)

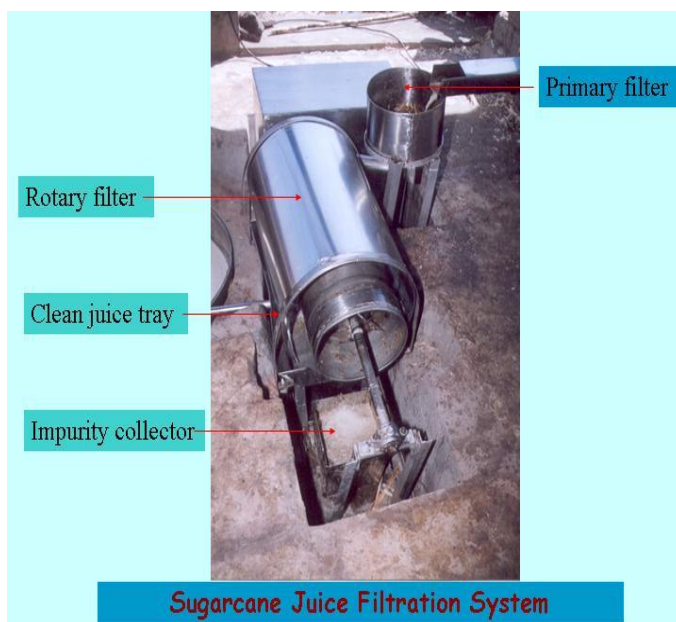
Agricultural & Food Engineering Dept.

Indian Institute of Technology

Kharagpur-721302 (India)

## Sugarcane Juice Filtration System

It is two stage filtration system fabricated from SS (304 grade). The first filter is stationary with 2mm size screen. The second filter is mechanical rotary filter having 0.5 mm screen size and covered over inclined cylinder. The rotary cylinder screen revolves around its longitudinal axis and separates out the juice impurities at lower end with the help of spirals provided inside it. The clean juice is collected in the tray placed below the cylinder.



### Specifications of the machine

Capacity : 700 Kg juice / hr  
Weight : 50 Kg  
Dimensions : 1330 X 720 X 770 mm  
Material of Make : SS 304  
Current cost of one unit: Rs. 85000/-

For further information please contact

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Email : rsjrs\_kpr@rediffmail.com

## **Liquid Jaggery Production Process**

Crushing of matured and clean sugarcane by horizontal three roller crusher. Cleaning of juice through double stage filtration system. Addition of lime @ 150- 200 g / 1000 L of juice for raising the pH of juice from 5.2 to 5.8 - 6.0 and application of fresh okra plant stalk @ 2 kg / 1000 L of juice for efficient clarification. Boiling of juice in boiling pan on furnace. Scum removal from juice at 85°C. Application of arsenic free phosphoric acid @ 150-200 ml / 1000 L of juice to neutralize the effect of lime and lowered down the juice pH to desired level. Removal of second golden scum from the juice with strainer whenever it appears on the top of juice. Control of excess frothing of juice by special equipment called churner, during rigorous boiling stage. Ascertain the liquid jaggery stage by electronic thermometer indicating striking temperature of concentrated juice at 103.50 to 105°C. Removal of boiling pan from furnace by tipping mechanism. Pouring of liquid jaggery in sterilized stainless steel tank for cooling. Application of citric acid @ 0.04 % in liquid jaggery to avoid crystallization during storage. Addition of potassium metabisulphite @ 0.1 % as preservative. Natural settling of liquid jaggery for the period 9 days in taper bottom settling tank. Filtration of liquid jaggery through nylon filter without disturbing the sediment. Gentle boiling of liquid jaggery and immediate filling in sterilized glass bottles and capping.

### **Specifications of the machine**

|                           |   |                                                                                                       |
|---------------------------|---|-------------------------------------------------------------------------------------------------------|
| Capacity                  | : | 1200 kg/ day                                                                                          |
| Weight                    | : | NA                                                                                                    |
| Dimensions                | : | NA                                                                                                    |
| Material of Make          | : | MS & SS 304                                                                                           |
| Current cost of one unit: |   | Rs. 10.0 lakh (construction of shed & furnace, purchase of machinery and equipment, steel tanks etc ) |

For further information please contact

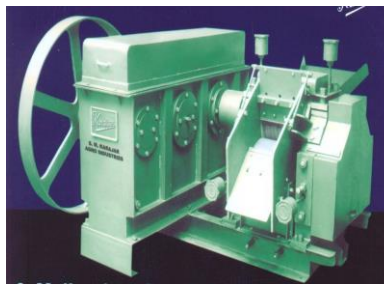
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### **IISR three pan furnace for jaggery making**

It consists of three open pans (200 l capacity each); one on the combustion chamber for juice boiling (circular with convex bottom of 31.75 mm thickness) and other two at staggered heights for self-emptying of juice by gravity after opening of gate valves (one similar to first with 25.4 mm bottom thickness and 38.1x38.1mm opening in center connected with 50.8 and 889 mm long GI pipe from bottom of pan for draining out juice, chamber of 1600x1600x50 mm, and second as rectangular gutter pan with convex bottom having 12.7mm thickness along length) for trapping waste heat going with flue gases and preheating the juice., step grate, rectangular flue passage, chimney made of masonry, bagasse feeding platform and ash pit having stairs After first pan is emptied attaining striking point temperature, the pre-heated juice is transferred into it by gravity drop system and the process continued.



### **Specifications of the machine**

Capacity : 120 kg juice per hour  
Weight : NA  
Dimensions : 2 X 6 m  
Material of Make : MS&GI  
Current cost of one unit: Rs. 65000/-

For further information please contact

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### **IISR Jaggery Drying-cum-Storage Godown**

The godown is suitable for medium level storage for storing 6 tonne of jaggery. It faces east direction and has ventilators on east and west wall and a double door system for entering into godown. Ventilators are kept opened in summer allowing hot westerly winds to enter in, which helps in drying of jaggery. During monsoon season, ventilators are closed. Jaggery is kept on angle iron racks.



### **Specifications of the machine**

|                           |   |                       |
|---------------------------|---|-----------------------|
| Capacity                  | : | 6 tonne jiggery/batch |
| Weight                    | : | NA                    |
| Dimensions                | : | NA                    |
| Material of Make          | : | Bricks, wood          |
| Current cost of one unit: |   | Rs. 2.00 lakh         |

For further information please contact

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## **Fish Ham**

Fish ham may be described as small cubes of red meat tuna, or shrimp chunks or mutton cubes, mixed with ground fish paste (as binding meat) and packed in synthetic casing, sealed and heat processed. The meat and fat pieces (cubes), form 50 to 60 percent of the product, exhibiting a mosaic pattern, when it is cut into slices. The dominating feature of the meat pieces in the product, gives the name “fish ham”. It can be preserved at refrigerated temperature more than one month.



**Fish  
Ham**

**Prepared in Synthetic Casing Ready-to-eat fish ham with red meat in sliced form**

**The following are the Machineries used in the production line of Fish ham**

1. Meat Picking or separating Machine
2. Meat Mincing Machine
3. Silent Cutter
4. Manual Fish Paste Stuffer

**For any further information please contact:**

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## **Fish Patties**

Fish patties a convenient, ready-to-cook fish product is gaining popularity in the market shelves of India. Fish being a major and cheap source of nutrition when added with suitable ingredients and addition with mushroom constitutes to be a highly value added and nutrient dense source of snack.

Fish patties is prepared from ground fish meat incorporated with button mushroom and a mixture consisting of mashed potato, salt, sugar, soya flour, spices and mixed with permissible preservatives to improve and enhance the nutritive value, quality and taste respectively. The mix is mould into definite shape and frozen in air blast freezer. They are packed in polyethylene bags and sealed hygienically. It can be preserved in cold storage temperature for more than 2 months.



**Ready-to-eat Fish Patties**

**The following are the Machineries used in the production line of Fish Patty**

1. Meat Picking or separating Machine
2. Meat Mincing Machine
3. Silent Cutter
4. Manual Fish Paste Stuffer

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## **Fish snacks using hybrid solar biomass powered dryer**

Dried fish snacks is a crispy ready - to - fry value added product prepared using hybrid solar biomass powdered dryer, which was developed by College of Fisheries, AICRP on PHET centre, Mangalore. The quality and storage stability of dried coated anchovy was prepared with standardized coating recipe which was better compared to uncoated sample. The coated dried fish snackpacked in polythene bag was observed to have a shelf life of 90days at ambient temperature.

### **Method of Production**

The fish is washed and dressed and the standardised coating mix containing Chilli powder, turmeric, corn flour, garam masala, ginger paste, garlic paste, salt and water is applied and kept at refrigerated temperature for 30 min. These coated fish is then arranged orderly onto the drying trays and subjected to drying in solar biomass hybrid drier up to 17 to 18 h until the moisture content of the product is reduced to 10 to 12 %. The dried product is then fried in edible vegetable oil for only 1 min and served.

### **The following Machine used in the production line of Fish snack**

1. Hybrid solar biomass powered drier.

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**Ready to eat Anchovies**

## **Pet treats from buffalo slaughter house by-products**

Value addition to the by-products increases the value of the carcass, and increases the profits of livestock raisers/butchers /entrepreneurs. In the past, by-products were a popular food in Asia, but health concerns have led to an increased focus on non-food uses, such as pet foods. The pet food is made generally for domestic animals by using different methods such as canned, dry and semisolid pet foods. The pet foods are manufactured using inferior quality/ low priced carcass parts, bones and organs such as intestines, kidneys, liver, lungs, udders, spleen, and stomach. In India the number of pet treats manufactures are very few and hence we have to import the pet food from other countries loosing the revenue from the pet products. Thus, process protocols have been developed and standardized to prepare the valuable pet treats from the inferior quality meat and meat by-products so as to reduce the economical losses of the farmers due to the wastages. We have standardized the process protocol for the preparation of *Buffalo Ear Treat*, *Buffalo Tendon Treat* and *Buffalo Tracheal Treat*.

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**Buffalo Ear Treat**



**Buffalo Trachea Treat**



**Buffalo Tendon Treat**



## **Preparation of fermented pork products**

Meat as a biological material contains all necessary components for bacterial growth and it is bacteriological fragile, therefore this product has to be maintained and stored at chilling temperature. In India due to tropical environmental condition wide range of temperatures observed in different parts, therefore it is essential to prepare the meat products which have stability at ambient temperature with low fat and low salt which can be popularized amongst health conscious people. Besides, the technology can be popularized in north-east region wherein about 70-80% Indian pig population is observed. Also in this region the environmental temperature observed is low as compared to other parts of country. This product has also wide scope in fast food centres where it can be used as pizza toppings, slice or fried sausages. We have standardized the process protocol for the preparation of Fermented Pork Sausages.

### **FOR FURTHER INFORMATION, PLEASE CONTACT:**

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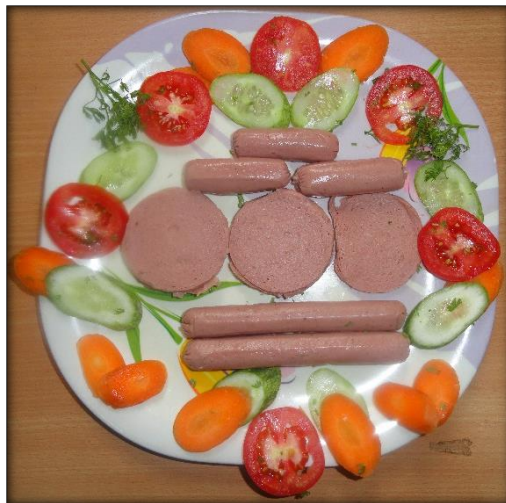
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**Fermented Pork Sausages**



## Maize Primary Processing

Technology for maize primary processing was developed as a value chain which included shelling by power operated maize sheller, drying in solar cabinet dryer, cleaning/grading in two screen cleaner-cum-grader and pearling by grain pearler. Three levels of moisture content and feed rate were combined to evaluate the performance of sheller in terms of machine capacity, shelling efficiency, percent grain damage and percent grain recovery. The combination of 14.20% d.b. moisture content & 1384.62 kg/h feed rate yielded maximum machine capacity (483.58 kg/h), maximum shelling efficiency (99.88%) and minimum percent grain damage (8.25%). However the maximum percent grain recovery (92.66%) was found at 14.20% d.b. m.c. & 1227.27 kg/h feed rate.

Drying experiments were conducted in second phase for *Shaktiman - I* and *Suwan* variety of maize grains. Grains were dried under sun as well as in solar cabinet dryer in three tray loadings of 14.070, 21.106, 28.141 kg/m<sup>2</sup>. The cost of drying was found less in dryer drying (12.00, 12.27, 12.80 Rs/kg) than sun drying (18.00, 15.50, 13.13 Rs/kg) in all the tray loadings giving better quality dried product. Tray loading of 14.070 kg/m<sup>2</sup> was found to be the best giving maximum moisture reduction in minimum drying time in both types of drying method with minimum cost of drying.

Pearling experiments were conducted by employing CIAE grain pearler for three varieties of maize grains (*Shaktiman - 1*, *Shaktiman - 4*, & *Suwan*) to see the effect of loading and running time on different dependent parameters like percent recovery of pearled grain and broken, 1000 pearled grain wt., machine efficiency etc. The moisture content of three varieties used for experiments was 13.57, 10.96, & 14.10 % d. b. for *Shaktiman - 1*, *Shaktiman - 4*, & *Suwan* variety respectively. The combination of 10.0 kg loading and 5 min running time emerged as the best optimized combination giving maximum recovery of pearled grains, maximum wt. of 1000 pearled grains and maximum efficiency.



Make – AGROSAW

Capacity – 2500-3000 kg/h

Power – 7.5 HP three phase electric motor or 25-35 HP Tractor

Material of construction – Iron

Overall Dimension –  
1625(L)×810(B)×1325(H) mm

RPM – 700

Approx. Wt. – 125 kg

Current cost – Approx. 29600/-



**Power Operated Maize Sheller**

**Solar Cabinet Dryer**

Make – Fabricated at CAE, Pusa  
Capacity – 10-30 kg depending upon the grain/vegetable  
Power – Solar energy  
Material of construction – M.S. sheet, Angle Iron, M.S. Flat, Polythene sheet  
Overall Dimension –  
1219(L) × 762(B) × 1077(H) mm  
Tray size –  
1030(L) × 690(B) × 105(H) mm  
Approx. Wt. – 50 kg  
Current cost – Approx. 4000/-



Make – CIAE, Bhopal  
Capacity – 100-300 kg/h  
Power – 5 HP three phase electric motor  
Material of construction – Iron  
Overall Dimension –  
1000(L)×1300(B)×1220(H) mm  
Approx. Wt. – 100 kg

**CIAE Grain Pearler**

### **FOR FURTHER DETAILS CONTACT**

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## **Fish Deboner**

A portable belt and drum type fish deboner of 60-80 kg per hour capacity was designed and developed at AICRP on PHT, Raichurcenter by selecting belt and drum mechanism of meat-bone separation from low value and under-utilized fish species. The deboner consists of one hp electric motor, perforated drum, conveyor belt, belt drum, adjustable tension roller, coupling, speed reduction gearbox, spur gear, main shaft, secondary shaft and chain sprocket mechanism. The operational parameters namely drum peripheral speed of  $10.31 \text{ m min}^{-1}$ , belt hardness of 45 shore and perforation diameter of 3 mm found optimum for maximum meat recovery and minimum bone content in minced meat. The efficiency of the unit was found to be 90-95 per cent. The current production cost of the developed fish deboner was found to be around Rs. 90,000/- and the cost of operation as Rs. 2.00 per kg of dressed fish. The net pay back period was 95 days of operation with benefit-cost ratio of 3.51. The technology would open the avenues for utilization of low value and under-utilized fishes as a cheap protein source thereby reducing the demand level of fish foods through supply of valuable protein to the consumers.

## **Specifications of the machine**

|                          |                                                    |
|--------------------------|----------------------------------------------------|
| Capacity                 | : 60 – 80 kg of dresses fish per hour              |
| Weight                   | : 75 kg                                            |
| Dimensions               | : L x W x H : 770 mm x 610 mm x 580 mm             |
| Material of Make         | : Stainless steel with mild steel supporting frame |
| Current cost of one unit | : Rs. 90,000/-                                     |

For further information please contact

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**Fish Deboner**

| <b>FISH DEBONER</b>                                                                 |                                                                                      |                                                                                       |  |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|
|  |  |  |  |
|                                                                                     | <b>Fish</b>                                                                          | <b>Minced Meat</b>                                                                    |  |
|                                                                                     |  |  |  |
|                                                                                     | <b>Fish Sausage</b>                                                                  | <b>Fish Sticks</b>                                                                    |  |
| <b>Fish Deboner</b>                                                                 |                                                                                      |                                                                                       |  |



### **Solar tunnel / multi-mode drier for grapes, chilli, fig, onion, fish**

The Solar tunnel / multi mode drier consists of a tunnel type semi cylindrical metallic (galvanized iron pipe) frame covered with UV stabilized transparent thermic polythene sheet of 600 micron. The drying tunnel has a sliding door of 1.5 m width and 2 m height for easy loading and unloading of the produce. An exhaust pipe (PVC) with two outlets (chimney) on either sides of drying chamber has been provided at the top of the tunnel. The exhaust pipe (PVC-120 mm dia.) drilled with a series of 12 mm diameter holes (25 mm spacing) throughout its length at the lower portion of the pipe and is provided for removal of moist air. Two ventilators were provided at the bottom of rear side of the dryer to create natural convection for the removal of moist air out of the dryer. For forced circulation of air, two fans at the inlet side and two at the exhaust side are provided. A suitable three tier supporting structures (trolleys) fabricated using 30 x 30 mm MS angle iron to hold trays inside the dryer. Solar panels for running the fans and electric heaters / waste fired gasifier can be provided as per requirement. Saving in drying time of 60-70 % and saving in the labour of 50-55 % could be achieved. The overall quality of the dried product was found to be superior than the open sun dried products. The design is available for 100, 1000, 2000 and 5000 kg of fresh produce.

#### **Specifications of the machine**

|                          |                                                                                                                                                                                              |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Capacity                 | : 100, 1000, 2000 and 5000 kg                                                                                                                                                                |
| Weight                   | : NA                                                                                                                                                                                         |
| Dimensions               | : 100 kg - L x W x H : 1.0 m x 1.0 m x 1.0 m<br>1000 kg - L x W x H : 10.0 m x 3.0 m x 3.2 m<br>2000 kg - L x W x H : 20.0 m x 3.0 m x 3.2 m<br>5000 kg - L x W x H : 28.0 m x 5.8 m x 2.1 m |
| Material of Make         | : MS angles, GI pipes, exhaust fans, door(s) and UV stabilized polyethylene sheet                                                                                                            |
| Current cost of one unit | : 100 kg - Rs. 65,000/-<br>1000 kg - Rs. 1,50,000/-<br>5000 kg - Rs. 5,50,000/-                                                                                                              |

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**Solar Tunnel / Multi Mode Drier (5000 kg Capacity)**



**Solar Tunnel Drier (1000 kg Capacity)**



**Solar Tunnel Drier (100 kg Capacity)**

### **Methionine Producing Probiotic Poultry Feed Supplement**

Methionine, is an essential amino acid necessary in poultry diet for better health of the birds in terms of proper cell growth, egg size and feather development. However, mixing of synthetic crystalline methionine with the poultry feed being practiced is undesirable as it is produced from hazardous chemicals such as acrolein, methylmercaptan, ammonia, and cyanide. Probiotic microorganisms having ability to produce methionine were isolated, screened and microencapsulated with suitable coating material. The supplementation of Methionine Producing Probiotic Microorganism (MPPM) with basal poultry diet improved the egg quality and bird's health. The probiotic activity was found to be  $4.33 \times 10^7$  cfu/g and the stability of microencapsulated powder was about three months in refrigerated condition.

#### **Specifications of the Technology:**

|                          |                                                    |   |
|--------------------------|----------------------------------------------------|---|
| Capacity                 | : Probiotic activity of $4.33 \times 10^7$ cfu/g   | : |
| Weight                   | : 50 g for mixing with 25 kg poultry feed          |   |
| Stability                | : Three months in refrigerated condition           |   |
| Material of Make         | : Probiotics with maltodextrin as coating material |   |
| Current cost of one unit | : Rs 250 per kg                                    |   |

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**Methionine Producing Probiotic Poultry Feed Supplement (50 g packet)**

### **Development of osmo-dried destoned apricot**

Osmotic dehydration of apricot and wild apricot (chulli) following different unit operations; blanching (1min)- destoning- dipping in hypertonic solution for 3 hours at 50°C - cabinet drying (50±2°C) for 7-8 hours- dried product with good sensory quality viz. colour, appearance and taste.

### **Development of different value added products from sugar syrup left after osmotic dehydration:**

The complete technology has been developed and standardized for development apricot squash, RTS, appetizer etc by utilizing the sugar syrup left after osmotic dehydration process. The sugar syrup replaced the sugar and help in reducing the cost of production of the processed products and also make nutritionally enriched fruit drinks (during osmotic dehydration, some of the components leached out in the syrup thus utilized for enrichment of the processed products).

#### **Continuous osmotic dehydration unit**

A pilot plant for osmotic dehydration of fruits was developed by Solan Centre of All India Co-ordinated Research Project on Postharvest Engineering and Technology. The pilot plant consists of two parts, one part rectangular main frame (775×480×1225mm) fabricated by using 50×50×6mm mild steel L angle to hold osmotic reactor, motor, and pump assembly and another frame was fabricated to hold mixing chamber.

**Main Chamber:** A cylindrical steel cylindrical chamber of 360mm dia and 465mm clear height was used as mixing chamber. Heating elements was fixed to the top container of the osmotic dehydration unit to heat the sugar syrup and one element in fruit holding container for maintaining the temperature during osmosis. Thermocouples are inserted to measure the temperature during process in the heating chambers. However, a control panel with suitable thermostat controls was connected to maintain syrup temperature.

A stainless steel container of size 330mm diameter and 440mm inner height was used as osmotic reactor. A stainless steel round shelf type holding pan of capacity 10-15 Kg fruits was used to hold the fruits.

A positive displacement pump of capacity 1HP was used to pump the sugar syrup from the mixing chamber to osmotic reactor and one 1HP motor has been provided for rotating the holding chamber.

### Specifications of the machine

Capacity : 10-15Kg fruits per cycle/unit (as per volume of fruits)

Weight : 145Kg

Dimensions : 820×480×1230mm

Material of Make : Stainless steel

Current cost of one unit: Rs 1 Lakh

For further information please contact

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**Osmotic Dehydration Unit in Operation**



### **Development of osmo-dried sand pear: analog of petha**

The technology for the development of osmo-dried sand pear :analog of petha involves different unit operations:- coring and peeling and slicing/cubes - dipping cubes/slices in 2%  $\text{CaCl}_2$  solution+0.01% acid or 3% salt solution immediately followed by blanching (5 min in boiling water containing 2% alum)- pricking (70 per cent)-dipping in hypertonic solution + Glycerine(50°C for 3 hrs)- rinsing with Potassium metasilphite solution (2000ppm)+ 0.4 % potassium sorbate- cabinet drying (55°C for 7-8 hrs) – packaging and storage

### **Continuous osmotic dehydration unit**

A pilot plant for osmotic dehydration of fruits was developed by Solan Centre of All India Co-ordinated Research Project on Postharvest Engineering and Technology. The pilot plant consists of two parts, one part rectangular main frame (775×480×1225mm) fabricated by using 50×50×6mm mild steel L angle to hold osmotic reactor, motor, and pump assembly and another frame was fabricated to hold mixing chamber.

**Main Chamber:** A cylindrical steel cylindrical chamber of 360mm dia and 465mm clear height was used as mixing chamber. Heating elements was fixed to the top container of the osmotic dehydration unit to heat the sugar syrup and one element in fruit holding container for maintaining the temperature during osmosis. Thermocouples are inserted to measure the temperature during processing the heating chambers. However, a control panel with suitable thermostat controls was connected to maintain syrup temperature.

A stainless steel container of size 330mm diameter and 440mm inner height was used as osmotic reactor. A stainless steel round shelf type holding pan of capacity 10-15 Kg fruits was used to hold the fruits.

### **Specifications of the machine**

|                           |                                                            |
|---------------------------|------------------------------------------------------------|
| Capacity                  | : 10- 15Kg fruits per cycle/unit (as per volume of fruits) |
| Weight                    | : 145Kg                                                    |
| Dimensions                | : 820×480×1230mm                                           |
| Material of Make          | : Stainless steel                                          |
| Current cost of one unit: | Rs 1 Lakh                                                  |



**1. Effect of the technology/process:**

Farmers are getting very less price for this crop due to gritty texture, high acid contents and astringency in the fruits. The developed technologies will definitely add value to the crop and if adopted at commercial level for value addition will help to raise the income of the farmers as well as entrepreneurs. The product developed is similar as petha.

**2. Economic gains** (per unit expenditure, gross income, net income, C:B ratio): At present farmers are getting only Rs 5-10 per Kg sand pear fruits due to its gritty texture and less acceptability in the market.

- By adopting the developed technologies the farmers/entrepreneurs can get maximum returns (3 times as compare to fresh fruits).
- The market rate for sand pear candy is Rs 150 per kg (Analog of Petha)









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## **Apple Seed Corer & Apple Seed Extractor**

### **A). Apple Corer**

The stainless steel corer is designed and fabricated with three core tubes of sizes (16mm, 18mm and 22mm) provided with three fruit holding cups with 60mm, 65mm and 75mm fruit sizes respectively. To make both hands free for holding the fruits, the foot pedal is provided for operating the machine along with core collectors. The efficiency of machine is 100kg fruits/hr compared to 14kg/hr fruits manually. The remaining sound cored fruits can be used for further value addition.

#### **Specifications of the machine**

Capacity : 100Kg apple fruits/hour  
Weight : 25Kg  
Dimensions : 105×46×31cm (H×L×B)  
Material of Make : Stainless steel  
Current cost of one unit:Rs 6,000

### **B). Apple Seed Extractor (Stainless Steel)**

Apple seed extractor with stainless steel contact parts and 1HP motor having two chambers one is for milling the cores and another for separating the seeds. Milling chamber is provided with five knives and water jets. Cores of the fruits are fed in the hopper and milled in the milling chamber & then the milled mass is passed to the seed separating chamber with the help of lever, comprising of seven knives and six shafts with water jets on all the sides. The seeds are separated from milled mass with the movement of knives and shafts and pressure of water. The seeds are collected in seed receiving trays while left over mass is drained from waste receiving end. The machine is having efficiency of 180kg core/hr in comparison to manually seed extraction of one kg core /hr.

#### **Specifications of the machine**

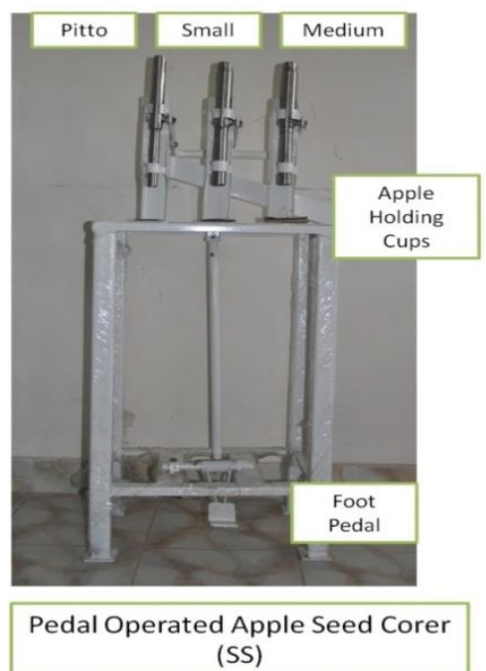
Capacity : 180Kg apple fruits/hour  
Weight : 54Kg  
Dimensions : 113×85×35cm  
Material of Make : Stainless steel  
Current cost of one unit:Rs 30,000

**Economic gains (per unit expenditure, gross income, net income, c:b ratio):**

The manual separation of the seeds from the fruits is not an economical operation as the production cost for apple seeds comes about Rs. 7855/- per kg. The efficiency of the seed corer and seed separator lowers down the cost involved for seed separation by reducing the labour cost and by increasing the germination efficiency.

**Suitability in the existing farming/cropping system:**

Manual coring performed by inserting fruit corer inside the fruit core is time consuming and it also damages the extracted seeds. It is evident that the mechanical coring device was most effective as the coring efficiency was found to 100kg fruits/hr compared to 14kg/hr fruits manually. The seed extractor is having efficiency of 180kg core/hr in comparison to manually seed extraction of one kg core /hr. In manual coring 10.7 fruits were damaged per unit time during coring against 5.3 fruits damaged during mechanical coring.



**Fig: Apple Corer**



**Fig: Pictorial representation of apple corer**



**Fig: Mechanical Apple Seed Extractor (in operation)**

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## Walnut Grader

The Srinagar centre of AICRP on PHET has successfully designed and developed a power operated walnut grader. The walnut grader is able to grade inshelled walnuts into 4 lots based on the size.

### Specifications of the machine

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Capacity                 | 250 kg/hour                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Weight                   | 65 Kg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Dimensions               | Front view= 110 × 135 cm, Side view = 255 cm × 110 cm                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Material of Make         | <ol style="list-style-type: none"><li>1. <b>Hopper:</b> MS Sheet (10,16,24 gauge).</li><li>2. <b>Main frame:</b> GI Pipes</li><li>3. <b>Rotating pipes:</b> PVC</li><li>4. <b>Shaft inside rotating pipe:</b> Mild Steel</li><li>5. <b>Covering of machine:</b> MS, GI sheets ( 24, 26 gauge)</li><li>6. <b>Colleting trays:</b> MS, GI sheets (24,26 gauge), low density carpet.</li><li>7. <b>Pulleys:</b> Cast iron</li><li>8. <b>Machine foundation padding:</b> Rubber</li></ol> |
| Current cost of one unit | 58,000/-                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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### **MAP of edible wax coated passion fruit**

A motorised wax applicator was developed for wax coating on passion fruit by AICRP on Post-harvest Engineering and Technology, Tavanur Centre. The wax applicator has higher coating efficiency with no mechanical damage to the fruits. The capacity of the developed wax applicator is 300 kg/hr. The machine consists of nine rollers with an inclination which enhances easy forward movement of the fruits. Shelf life of the wax coated (natural and commercial wax) passion fruits under MAP was 40 days under optimum storage conditions (7°C & 90% RH).

### **Specifications of the machine**

Capacity : 300 kg/hr

Weight : 30 kg

Dimensions : Length – 1524 mm  
Height – 1219 mm

Material of Make : Frame -Mild Steel  
Conveying material -stainless steel  
Rollers -stainless steel  
Hopper -Stainless steel

Current cost of one unit :Rs. 25,000/-

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## Development of extruded RTE snack food from starch based food products

Extruded RTE product was developed with rice and banana in different combinations. Four different blends were used for the study viz., R<sub>60</sub>:B<sub>40</sub>, R<sub>70</sub>:B<sub>30</sub>, R<sub>80</sub>:B<sub>20</sub> and R<sub>90</sub>:B<sub>10</sub>. The product was extruded in a single screw food extruder under different die zone temperatures of 170, 180, 190, 200°C with an extruder screw speeds of 80, 100 and 120 rpm. Quality of the 48 extrudates were assessed in terms of bulk density, expansion ratio, water activity, water absorption index, water solubility index and textural property (crispness) and browning index. The extruded samples were then packed in laminated aluminum pouches (400 gauge) with nitrogen flushing and kept for storage studies. In third month, the quality of the products were analyzed for different properties like bulk density, expansion ratio, water activity, water absorption index, water solubility index and textural property (crispness) and browning index.

Further, 10 extrudates were selected with an expansion ratio above 3.0 and bulk density up to 0.15 g/cm<sup>3</sup>. Quality evaluation of these extrudates in terms of physical, functional, textural and organoleptic properties was analyzed. The Duncan test carried out for the 10 selected samples to analyze the textural properties viz., hardness, toughness, snap force, snap energy and biochemical (moisture content, starch, sugar, protein, fat and total energy). Based on the results obtained for various properties of selected extrudates with rice and banana, the treatment T<sub>6</sub> (R<sub>70</sub>:B<sub>30</sub> extruded at 200°C and 120 rpm) was found to be better with respect to expansion ratio, crispness, and sensory score. Shelf life study of the extrudates under ambient temperature showed that the optimized treatment could store for more than one year using suitable packaging technology.



- Cost : Rs3/- per 20g pack
- For further information please contact

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Associate Professor

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## Development of thermally processed jack fruit

Jackfruit is a nutritious fruit, rich in vitamins A, B and C, potassium,  $\beta$  carotene, calcium, iron, proteins and carbohydrates. The highly perishable nature as a result of its inherent composition and textural characteristics has limited its storage for a longer time. The lack of proper postharvest knowledge during harvesting and storing contributes to the considerable wastage of the fruit yearly. Hence it is necessary to develop or to standardize a postharvest technology for prolonging the shelf life without significant alterations in the quality attributes. Development of processing and storage technologies like blanching and thermal processing facilitates the exploitation of the market potential of jackfruit by making them available to the consumers in a ready to eat or cook form throughout the year. The improvement on tender jackfruit blanching treatment application, prior to canning, is required aiming at product's quality improvement. As the research on jackfruit has not been much discussed in the literature, the present study focused on the optimization of blanching process, specially blanching time which extends the shelf life without much alteration in nutritional and organoleptic qualities of the canned jackfruit.

Accordingly, a process protocol was developed for canning of “Varikka” variety of tender jackfruit. Treatment combination like blanching process (0.3% citric acid at 100°C for a period of one minute), thermal processing parameters viz; time, temperature (pasteurization at a temperature of 90°C for F value 10 (19 minutes) and sterilization at 121°C for  $F_0$ 1 (38 minutes) and preservative were also optimized based on the quality analysis and shelf life. A shelf life of 1 years could be achieved for pasteurised and sterilised tender jack fruit at refrigerated storage and ambient condition respectively, using this new technology.



**Canning of tender jackfruit**

- Cost of production per can of tender jackfruit t- Rs.25/-
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## Process Technology for Garlic Flakes and Powder

### Description of Technology :

Garlic has medical property and used in the form of powder, flakes and paste in various food preparations and medicines India is exporting garlic in whole and powder form to various countries. Simple processes were developed to dehydrate garlic cloves and make its flakes and powder. The individual cloves are separated from bulb through a garlic bulb breaker. The cloves are then flattened/pressed mildly through a garlic flaking machine or cut into 4-6 mm long pieces through a slicer /steel knife. This operation facilitate in rupture of papery skin of cloves to enhance the drying rate considerably. Then the cloves are dehydrated using a solar dryer (2-3days) or a mechanical tray dryer (55<sup>o</sup> Cfor 7-8 h). The dehydrated flakes/slices could be stored and used as such or could be converted into powder after size reduction to 75 mesh size. Special care has to be taken for hermetic storage/packaging of powder in a glass bottle / HDPE bottle/pouches, as it is very hygroscopic in nature and if kept in open for a short while it will absorb moisture from atmospheric and clump formation occur.No blanching/pre-treatment is required before dehydration of garlic.



|                                                                 |   |                                                                                                                                                                            |
|-----------------------------------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Input/raw material</b>                                       | : | Sound garlic bulbs                                                                                                                                                         |
| a) Overall dimension                                            | : | NA                                                                                                                                                                         |
| b) Weight                                                       | : | NA                                                                                                                                                                         |
| c) Prime mover                                                  | : | Electrical motors                                                                                                                                                          |
| d) Plant & Machinery                                            | : | Garlic bulb breaker, Grading machine, Garlic flaking machine, Slicer/knives, Solar/ mechanical dryer, Heat sealing machine, Pulveriser.                                    |
| e) Power                                                        | : | 5 hp, 3 phase power connection                                                                                                                                             |
| f) Man power                                                    | : | 3 unskilled labours                                                                                                                                                        |
| g) Land                                                         | : | 200 Sq m                                                                                                                                                                   |
| h) Investment                                                   | : | Rs 2,50,000/=                                                                                                                                                              |
| i) Operational effi.:                                           | : | 75—80%                                                                                                                                                                     |
| <b>Output capacity</b>                                          | : | 30-50 kg/day depending on dryer capacity                                                                                                                                   |
| <b>Unit cost (per machine)</b>                                  | : | Rs 2,50,000/=                                                                                                                                                              |
| <b>Suitability for crops/commodity</b>                          | : | Garlic                                                                                                                                                                     |
| <b>Efficiency</b>                                               | : | Flakes/powder recovery: 28-30%                                                                                                                                             |
| <b>Unit cost of operation</b>                                   | : | Rs 15/kg of dehydrated product                                                                                                                                             |
| <b>Patent obtained/applied</b>                                  | : | NA                                                                                                                                                                         |
| <b>Commercialization status</b>                                 | : |                                                                                                                                                                            |
| a) No. of Licensees to whom the technology has been transferred | : | Farmer-cum-processor/entrepreneur                                                                                                                                          |
| b) Selected Addresses of Licensee or Manufacturer               | : | -                                                                                                                                                                          |
| Contact address                                                 | : | Research Engineer, AICRP on PHT<br>College of Technology & Argil. Engineering,<br>Maharana Pratap University of Agricultural & Technology,<br>Udaipur– 313 001 (Rajasthan) |

## Shrink wrap packaging of fruits and vegetables (kinnow, capsicum and tomato)

Shrink-wrap packaging is the best for extending shelf life, maintaining the quality and reducing the refrigeration cost. Other salient features are:

- Reduces water loss and maintain freshness of fruits.
- The whole fruit surface can be examined prior to purchase
- Prevents secondary infection which is important for long term storage
- Reduces chilling injury during cold storage and Avoid condensation of droplets inside the package.
- Delay ripening and avoids undesirable colour development
- Avoid physical damage during rough handling and minimize the use of chemicals.
- Better consumer appeal and thus fetches higher price in the market.

Performance of the technology: Shrink wrapped kinnow fruit stored at low temperature up to 10 weeks as against four weeks at ambient condition. LLDPE film with 20 $\mu$  thickness was found to be worthwhile proposition for individual shrink wrapping of kinnow fruit. Polyolefin film wrapping with 15 $\mu$  for tomato and 19  $\mu$  for capsicum was quite effective in extending the storage life. Individual fruit wrapping with 15 $\mu$  film extended the storage life of tomato by 20 days under ambient condition and 38 days under low temperature conditions. Unwrapped capsicum lasted only for 3-4 days. Individual shrink wrapping extended the shelf-life of capsicum to 24 days under ambient storage.

Seal and cling packaging of capsicum resulted in a storage life of 15 and 9 days, respectively.

### Specifications:

|                          |                                                                                                                |
|--------------------------|----------------------------------------------------------------------------------------------------------------|
| Capacity                 | : NA                                                                                                           |
| Weight                   | : NA                                                                                                           |
| Dimensions/Machine       | : Shrink wrapping machine, L-Sealer and Impulse sealer.                                                        |
| Material of Make         | : 20 $\mu$ LLDPE for kinnow fruits<br>15 $\mu$ Polyolefin for tomato<br>15 $\mu$ Polyolefin for capsicum       |
| Current cost of one unit | : Cost of individual shrink wrapping of fruit :Rs 0.28<br>Cost of shrink wrapping for one kg of fruit :Rs 1.40 |

### For further information please contact:

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### Photographs:





## **VL Paddy Thresher with plastics components**

In hills the threshing of paddy is conventionally done manually (either by beating out the grains with sticks or by rubbing out under the feet) which often is time and labour intensive. The beating method of paddy threshing leads to grain loss due to shattering. A light weight VL Paddy thresher with plastic components was designed and developed for entire Himalayan Region, where the drudgery caused by the weight of the machine is a major concern. To overcome this problem, GI sheet was replaced by polycarbonate sheet of 1 mm thickness. Earlier transportation of the machine was the major hindrance for its use in the hilly region due to its weight. The machine appears to be less noise producing during operation as compared to the metal body. It also reduces the probability of injury hazards during operation. Since the sharp edge of metal body may cause injury during transportation and operation. The plastic body has another advantage of being rust proof. The machine is manually operated by single man. This thresher has got overwhelming response among the hill farmers. The thresher is being commercially fabricated through a private workshop (M/s Gopal Engineering, Makeri, Dharanaula, Almora, (Uttarakhand). Feed-back received from most of the users indicated high degree of appreciation of this machine.

### **Specifications:**

|                          |                                               |
|--------------------------|-----------------------------------------------|
| Capacity                 | : 80-100 kg/h                                 |
| Weight                   | : 32 kg                                       |
| Dimensions               | : Length 1030 mm, width 630 mm, height 975 mm |
| Material of Make         | : Mild Steel and polycarbonate sheet          |
| Current cost of one unit | : Rs. 6000/-                                  |

### **For further information please contact:**

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### **Photographs:**



## Plastic Maize Sheller

Plastic Maize Sheller was developed by ICAR Research Complex for NEH Region, Umiam. Maize is the second largest cereal crop in the north eastern region. It is cultivated in 0.15 mha area accounting 60% of the cultivated area of the region. The total production of the crop is 2.5 lakh tons with productivity of 1.66 tons/ha. Among the various operations performed in the maize crop, the shelling operation requires very high amount of energy and labour. The tubular and octagonal iron maize Shellers were developed by the ICAR and were popularized among the farmers in the region. After using the developed maize Sheller farmers came with feedback that they got exhausted after 15(Women)-30(Men) minutes and need break for 15-20 minutes due to more weight of iron maize Sheller. They suggested for reducing the weight for more time of operation of maize Sheller. Apart from this, it was felt that the region with highest annual rainfall has conducive environment for rusting of parts made of iron. Therefore, parts made up of plastics have an additional advantage of longer life and requires less maintenance. Keeping in view, the existing tubular maize Sheller has been modified by replacing the outer cover by using the plastic equivalent using 60 mm inner diameter PVC pipe. It saves 66% labour and operating time and 70% cost of operation. The cost of modified maize sheller is Rs.85/ Unit. The modified maize sheller was tested and recommended for maize shelling in the region.

### Specifications:

|                          |                                                      |
|--------------------------|------------------------------------------------------|
| Capacity                 | : 30 kg/hr                                           |
| Weight                   | : 90 g                                               |
| Dimensions               | : Length 70 mm, Inner diameter 60 mm, thickness 2 mm |
| Material of Make         | : PVC pipe and GI fins                               |
| Current cost of one unit | : Rs. 85/-                                           |

### For further information please contact:

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### Photographs:



## Development of multi-tier multi-purpose polyhouse for drying of produce and raising of crop nursery/ small height crops

The multitier multipurpose polyhouse (MTMPP) developed by the AICRP on PET's Gangtok Centre at CAEPHT, Ranipool is a "lean to" type poly structure which has been designed to be kept in the south facing terraces in the hilly terrain. The full load capacity of the drying chamber is 14-16 kg. The cultivation chamber can be used for growing short height plants as well as for nursery raising. The drying chamber receives solar radiation through the top plastic cover and the removal of moisture of food products placed inside the drying chamber takes place through natural convection. Placing plastic covering produces a greenhouse effect to trap the solar energy in the form of thermal heat radiation and prevents conduction heat loss.

The full load performance evaluation of the polyhouse was carried out for five consecutive days to dry cherry peppers (*dalle*, local chilli). The moisture content of cherry peppers in the polyhouse dryer was reduced from an initial value of 85 % (w.b.) to the final value of 10 % (w.b.) within 58 hours whereas the moisture content of the sun dried samples (control) was reduced to 60 % (w.b.) within the same period. A 46.42 % saving in drying time was achieved for polyhouse drying relative to open sun drying. The total cost of cultivation of strawberry including the major proportionate cost of construction of MTMPP and drying materials would come out to be `26960/- for an MTMPP of 4 m<sup>2</sup>. The total value of returns was `43650/- giving a net income of `16690/- and benefit cost ratio of 1.61.

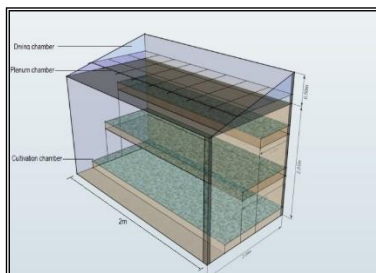
### Specifications:

|                          |                                                                                    |
|--------------------------|------------------------------------------------------------------------------------|
| Capacity                 | : 4 sq. m (Nursary)<br>14-16 kg (drying)                                           |
| Weight                   | : NA                                                                               |
| Dimensions               | : Length 2.00m; Width 2.00m, Height 2.50m                                          |
| Material of Make         | : Iron frame/ structure covered with 120 gsm UV stabilized with LDPE film as cover |
| Current cost of one unit | : Rs. 26960/-                                                                      |

### For further information please contact:

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### Photographs:



### **Reduction of transportation losses for delicate fruits and vegetables (sapota and tomato)**

A foldable plastic box with cells was designed and developed with the help of Nilkamal Limited, Rajkot. Size: 390×325×245 mm (0.031 m<sup>3</sup>) Thickness of sheet : 3.5 mm. The box was made with full corner reinforcement on four corners to bear the load of upper box and protection during transportation. To minimize transportation losses of fruits and vegetables by development of proper container which reduces mechanical damage *i.e.*, jerk, rolling, vibration and impact damage during transportation.

This box can be used for transportation of same size of fruits & vegetables. For transportation of large size commodities, slots are provided to adjust or make large cells of the box. Fruit can be placed individually in a particular cell, so load of upper layer of the fruit can be minimized. Cell size matches with the fruit size, so no chances of rolling of the fruit during transportation and damage is minimized. It is completely foldable box and can be made as a sheet after transportation so volume of the box is reduced and cost of returning empty box is also reduced.

Handling of the box should be done properly. Overloading should be avoided. Fruit size should not be more than cell size.

#### **Specifications:**

|                          |                                                                         |
|--------------------------|-------------------------------------------------------------------------|
| Capacity                 | : 10 kg                                                                 |
| Weight                   | : 1.480 kg                                                              |
| Dimensions               | : Length 390 mm; Width 325mm, Height 245mm,<br>Thickness (sheet) 3.5 mm |
| Material of Make         | : Poly propylene (650 g/m <sup>2</sup> )                                |
| Current cost of one unit | : Rs. 425/-                                                             |

#### **For further information please contact:**

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#### **Photographs:**



### **Modified atmosphere packaging (map) for sapota and mango**

Uniformly matured fresh sapota fruits were precooled at 10°C for 1 h and pretreated with 200 ppm benomyl for 5 min. The fruits were packed in 25 µm and 40 µm LDPE bags with 5 % O<sub>2</sub> + 5 % CO<sub>2</sub> and 5 % O<sub>2</sub> + 10 % CO<sub>2</sub> gas concentration and stored at 6 ± 1°C and 11 ± 1°C temperature. Results revealed that sapota fruit was stored up to 35 days at 11°C in 25 µm LDPE bags and fruits ripened within the package during storage. It was concluded that the shelf life of sapota fruit could be increased up to 49 days by packaging in 25 µm LDPE bags with gas concentration 5 % O<sub>2</sub> + 10 % CO<sub>2</sub> and stored at 6°C with additional three days to become fully ripe under ambient conditions. Fruits packed in 40 µm LDPE bags did not ripen properly at both the storage temperature.

**Cost economy:** Total cost of packaging of sapota per kg was estimated to be Rs. 4.25 with net profit 8.75Rs./kg and benefit-cost ratio 1.54

Freshly harvested and uniformly matured hard mango fruits cv Kesar were pretreated with hot water solution (50±2 °C) of plant based fungicide (5000 ppm) for five min. The fruits were treated with active MAP with two levels of O<sub>2</sub> concentration (3 % and 6%), two levels of CO<sub>2</sub> concentration (5% and 10%) with balance N<sub>2</sub> packed in 25 µm thickness of LDPE bags and stored at temperature (10 ± 1 °C and 15 ± 1 °C). The fruits stored at room temperature without packaging was considered as control. The fruits were analyzed at weekly intervals for physical, biochemical and sensory characteristics. The shelf life of mango increased up to only 21 days by packing in 25 µm LDPE bag at 15°C storage temperature at all gas combinations. Results revealed that mango fruit could be stored up to 35 days by packing in 25 µm LDPE bag at 6 % O<sub>2</sub> + 5 % CO<sub>2</sub> gas concentration and 10°C storage temperature with highest score of physico-chemical and sensory characteristics within permissible limit of microbial parameters. Sensory characteristics of mango fruit were not found significant for all the treatments up to 21 days of storage. **Cost economy:** Total cost of packaging of mango per kg was estimated to be Rs. 5.03 with net profit 14.97 Rs./kg and benefit-cost ratio 1.60

#### **Specifications:**

|                          |                                                                                                                                                                     |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Capacity                 | : NA                                                                                                                                                                |
| Weight                   | : NA                                                                                                                                                                |
| Dimensions               | : 6%O <sub>2</sub> + 5%CO <sub>2</sub> gas concentration at 10°C storage (mango)<br>5%O <sub>2</sub> + 10%CO <sub>2</sub> gas concentration at 6°C storage (sapota) |
| Material of Make         | : 25µ LDPE bag                                                                                                                                                      |
| Current cost of one unit | : Rs. 5.03/kg (mango)<br>Rs. 4.25/kg (sapota)                                                                                                                       |

#### **For further information please contact:**

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Photographs:





### **Low cost plastic ripening chamber for ripening of mango**

Mango is often harvested in a mature but unripe condition, and is subsequently allowed to ripen further. In natural conditions, they ripen slowly, leading to high weight loss, desiccation, and ripening is also uneven. The ripening chamber is commercially used for ripening of mango, banana etc. and ethylene is used as ripening agent. Calcium carbide is banned in India for ripening of fruit under the Prevention of Food Adulteration (PFA) Act, 1954 and Prevention of Food Adulteration Rules, 1955. Usually ethrel spraying or dipping of fruits in ethrel is recommended for enhancing ripening, but it is a cumbersome process, and may cause some problems if commercially available ethrel is with chemical impurities. To overcome this, ethylene gas has been commercially used in modern ripening chambers, which require huge investments and are not economically viable option for farmers and small traders. An alternative, simple economical method is standardized for enhancing ripening of fruits by exposing fruits to ethylene gas in the plastic tents. A ripening chamber can be constructed by using frame of iron wire and it had been covered with plastic film (200 micron). To make it air tight the bottom of the ripening chamber was welded with 20 gauge mild iron sheet and a profile with gripper arrangement was fixed on the sides of the chamber to fasten the plastic sheet.

The low cost ripening chamber is designed and tested for ripening of mango successfully. The ratio of chemicals (ethrel and sodium hydroxide) and water required for ripening chamber were calculated. The mango was exposed for 24 hour in the ripening chamber. The cost of ripening for mango using low cost ripening chamber (cost of ripening mixture) comes out to be less than five paisa per kilogram.

#### **Specifications:.**

|                          |                                                   |
|--------------------------|---------------------------------------------------|
| Capacity                 | : 180 kg.                                         |
| Weight                   | : NA                                              |
| Dimensions               | : Length 120.00cm, Width 80.00cm, Height 90.00cm, |
| Material of Make         | : 200 $\mu$ Plastic film and 20 gauge MS Sheet    |
| Current cost of one unit | : Rs. 600/...                                     |

#### **For further information please contact:**

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#### **Photographs:**



### **Portable low cost solar multi tier poly tunnel dryer for fruits and vegetables**

This technology will enhance the income of the farmers after selling the dehydrated products. Moreover, the usage of the dehydrated products for the family is fulfilled. The capacity of the Solar poly tunnel drier with two trays was 4-6 kg/batch. The benefits involves the dehydrated product for the fulfilling the need of one middle family owners; thus making use of the dehydrated products during the harsh winter duration. This technology is environmentally safe and its social impact is much higher as the family and neighbours can also make use of this technology when needed. Beneficiaries belong to the farming community in different districts of Kashmir valley where farmers made indigenous type of polyhouses and also the polytunnel dryer to dry their vegetables. Also in the peri-urban areas of Srinagar districts it is more prominent (more in the vegetable growing areas). During the operation of the dryer, cleanliness of the fruits and vegetables under usage must be maintained and also the operator hands must be hygienic and clean.

#### **Specifications:.**

|                          |                                                   |
|--------------------------|---------------------------------------------------|
| Capacity                 | :4-6 kg/batch                                     |
| Weight                   | : 4.5 kg                                          |
| Dimensions               | : Length 1.50m, Width 0.67m, Height 0.55m,        |
| Material of Make         | :MS sheet , 200 $\mu$ UV stabilized plastics film |
| Current cost of one unit | : Rs. 3500/...                                    |

#### **For further information please contact:**

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#### **Photographs:**



### **Utility of plastics in handling, packaging and transportation of custard apples**

Tribal of Devla Region of Udaipur were involved in fetching good prices of Custard Apple through Scientific intervention of training, forming society for marketing of produce, using plastic sheet as cushion material for filling crates through common collection centre and deciding the fixed price of the produce through society. Basic principle of success of adoption is direct benefit through society. Earlier to this intervention, collection of harvested custard apple were made through bamboo baskets or jute bags. These packing were having variable weight and could not be staked. Availability of 20 kg Plastic Crates with cushion material made it possible to pack and stake the material in multiple layers. It was first attraction of tribals to join samiti. This method of marketing through society could be replicate to any place for collection and market the forest produce like Honey, Gum, and medicinal plants.

Collection and transportation of custard apple through plastic crates of 20 kg made available by the Vanwasi Forest and Agricultural Produce Cooperative Samiti, Devla could reduce losses, could be used repeatedly year after year and eco-friendly. The system performance is enhanced by reducing losses and fetching fair price of produce. Before forming society, produce were sold on road side at variable cost. It was loss of labour and time of tribal. Collection of produce at collection centre provided sustainable and fixed return per crate. It also ensures the sustainable supply to the consumers. Major consumers are raw food eaters. But a machine has been developed by MPUAT, Udaipur and CIPHET, Ludhiana for pulp separation. Efforts are being made to make it popularise in ice-cream producers for custard apple flavoured ice cream.

#### **Specifications:**

|                          |                                              |
|--------------------------|----------------------------------------------|
| Capacity                 | :20 kg                                       |
| Weight                   | : 1.80 kg                                    |
| Dimensions               | :Length 54.00cm Width 35.00cm Height 30.00cm |
| Material of Make         | :Plastics crate                              |
| Current cost of one unit | : Rs. 180/...                                |

#### **For further information please contact:**

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#### **Photographs:**



## Guava Harvesting package

A fruit harvesting package for guava was developed by Department of Farm Machinery and Power Engineering, College of Technology and Engineering, Maharana Pratap University of Agriculture and Technology, Udaipur. The harvesting package was developed to reduce fruit damage and drudgery involved in the traditional method of guava harvesting. It consists of a cutting tool, a thumb cap, a collection bag and an adjustable harvesting platform. The fruit harvesting is performed by cutting the pedicle with the help of cutting tool and thumb cap. The collection bag is used for storing harvested fruit up to 10 kg.

The height of adjustable harvesting platform (1.5-2.5 m height) can be adjusted according to the height of fruit on the tree. The developed package is suitable for harvesting all kind of fruits having the tree height up to 4.5 m. One can harvest about 51 kg of fruit in an hour without any damage. The harvested fruit is having more shelf life and will fetch better economic return because of less damage to the fruit and presence of pedicle along with fruit. The developed cutting tool and the collection bag can also be used for harvesting vegetable crops.

|                          |   |                |
|--------------------------|---|----------------|
| Capacity                 | : | 51 kg per hour |
| Material                 | : | Mild Steel     |
| Current Cost of one unit | : | Rs. 1800       |

### Dimensions:

#### a) Adjustable platform

| S. No. | Particular                                         | Measurement |
|--------|----------------------------------------------------|-------------|
| 1.     | Minimum height of platform (mm)                    | 1500        |
| 2.     | Maximum height of platform (mm)                    | 2500        |
| 3.     | Dimensions of standing platform (mm <sup>2</sup> ) | 600 X 600   |
| 4.     | Base width (mm <sup>2</sup> )                      | 950 X 800   |
| 5.     | Material                                           | Mild steel  |

#### b) Collection bag

| S. No. | Particular                                      | Measurements |
|--------|-------------------------------------------------|--------------|
| 1.     | Diameter of collection bag (mm)                 | 230          |
| 2.     | Depth of collection bag (mm)                    | 400          |
| 3.     | Capacity of Collection bag on weight basis (kg) | 10           |
| 4.     | Material of bag                                 | Canvas       |
| 5.     | Width of belt of bag (mm)                       | 35           |
| 6.     | Material of belt                                | Polythene    |

#### c) Cutting tool & thumb cape

| S. No. | Particular                 | Measurement |
|--------|----------------------------|-------------|
| 1.     | Length of blade            | 23 mm       |
| 2.     | Thickness of blade         | 0.2 mm      |
| 3.     | Diameter of ring (outside) | 19 mm       |
| 4.     | Thickness of ring          | 1.0 mm      |

|   |                   |                   |
|---|-------------------|-------------------|
| 5 | Material of blade | High carbon steel |
| 6 | Material of ring  | Aluminium         |



**Guava harvesting package**

**For further Information please contact**

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## Manual ragi thresher-cum-pearler

Threshing of ragi is traditionally done by hand beating with a wooden stick on a hard surface which is a drudegrious operation with a lower output and time consuming. Hence a pedal operated ragi thresher has been developed by AICRP on ESA with threshing capacity of the machine found to be 30kg/h against 8 kg/h in case of traditional practice. This is also with the allowable working heart rate of 105 beats/min with respect to 119 beats/min in case of traditional method. The operating cost of threshing of one kg of ragi by developed thresher has bend calculated to be Rs.2.43. Similarly the pearling capacity is found to be 44 kg/h against the traditional practice of 5 kg /h generally done in hand or foot pounding. This may be popularized in the tribal districts where there is a shortage of labour and the poor socio-economic condition of the people along with uneven power supply.

|                                           |                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Capacity                                  | : 30 kg / h                                                                                                                                                                                                                                                                                                                                            |
| Weight                                    | : 57 kg                                                                                                                                                                                                                                                                                                                                                |
| Dimensions                                | : 1170 mm x 480 mm x 850 mm (L x B x H )                                                                                                                                                                                                                                                                                                               |
| Material of make                          | : Iron sheet, angle, rods & cast iron product.                                                                                                                                                                                                                                                                                                         |
| Current cost of one unit                  | : Rs.8,500/-                                                                                                                                                                                                                                                                                                                                           |
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Colour photo :





### **Women friendly paddy thresher with safety cover**

Paddy is grown in 46 lakh hectare in Odisha in both Kharif and Rabi seasons. Tractor treading and bullock treading are the common mode of paddy threshing operation in Odisha. During last three years axial flow thresher are also tried by the agricultural workers in Odisha. The total area covered under these modes of harvesting covers less than 10% of total area. Since 90% of total paddy area is harvested manually mostly by beating methods, which is time consumption and drudgerious. Pedal thresher has also been popularized by the farmers having small land areas. Minor injuries, accidents are also noticed by these thresher. Keeping this in view a pedal thresher with safety cover was developed by AICRP on ESA, OUAT with a threshing capacity of 40 kg/h. The reduction in drum size has been made to suit one worker operating at a heart rate of 125 beats per minute. Labour saving upto 50% has been achieved as compared to manual method of beating. This is recommended for both male and female agricultural workers in Odisha for reduction of drudgery with increasing efficiency.

Capacity : 52 kg / h

Weight : 40 kg

Dimensions (W x H) : 690 mm x 960 mm

Material of make : Iron

Current cost of one unit : Rs.6500.00

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Colour photo :



### **Gravity based rope way for carrying agricultural produce in hilly terrain**

Gravity based rope way for carrying agricultural produce in hilly terrain was developed by College of Agricultural Engineering and Post Harvest Technology (Central Agricultural University), Ranipool, Gangtok. In hilly areas, generally women and children carry heavy loads on their backs hanging from the fore head. When it rains, or there's a landslide, the situation becomes more pathetic. The gravity based rope way is fossil fuel free technology and may be used for transporting agricultural produce from the field to home stead/market/road head between 15 to 40 degree slopes. The gravity ropeway works on gravitational force (Newton's law). It is consisted of;

**(i) Haulage ropes/control cable:** It provides the traction force and hauls carriages on the track rope.

**(ii) Track Ropes/support cable:** It supports carriers/trolleys. The carriages are hanging through pulleys at opposite ends and slides to and fro on this rope.

**(iii) Carriage/trolley/basket:** A basket or carrier made up of the mild steel flat for carrying the goods. Its size and shape varies according to the nature and quantity of loads to be carry.

**(iv) Tower/ Thrust pillar:** GI pipe or concrete structure placed at upper and lower station to support the track cable to absorb the possible thrust.

**(v) Stations:** Upper and lower stations consist of landing platform, space for storage of materials.

**(vi) Brake:** A wooden brake shoe with hand lever touching to the flywheel is fitted mainly at the lower station (may be fitted to upper station also) to control the velocity of moving trolley.

The feasibility study revealed that the transportation cost was only one fourth compared to traditional methods (back-pack loading). It was observed that speed of the ropeway is insignificantly affected by the carrying load. The regression equation " $y = 1.1606 x + 12.68$ " may be used to find out the gravity load required for carrying given load from lower station to upper station with regression coefficient of 0.9976 at 30 degree slope.

#### **Specifications of the ropeway**

Capacity (carriage) : 70 kg/batch

#### **Dimensions**

Span : 150 m

Slope : 30°

Support columns : MS pipe, 100 mm dia, 300 mm height and 300 mm apart

Flywheel : Cast iron, 600 mm dia, fitted on iron rails

Brake system : Wooden shoe type, hand lever control

Control cable : 6 mm dia rope, 0.20 kg/m weight

Support cable : 10 mm dia rope, 0.60 kg/m weight

Tie rope : 6 mm dia, 20 m length, 0.20 kg/m weight

Carriage (trolley) : 620 x 480 x 450 mm made of MS flat

Current cost of one unit :Rs 3.00 lakh (for 150 m span)

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## **Pedal and power operated arecanut dehusker**

Pedal and power operated arecanut dehusker has been developed by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra. The pedal operated dehusker consists of cylinder, concave, rubber beaters, hopper, chain and sprocket power transmission, pedal and seat. The dehusking mechanism is based on combination of impact, compression and shear. Dehusking cylinder with rubber beaters is rotated by pedaling and arecanuts are dehusked between rotating cylinder beaters and concave. The output of the machine is in the form of mixture of arecanut kernels and husk which need to be separated manually. Mean value of the heart rate of male workers operating the unit is around 127 beats/min indicating that the unit can be operated comfortably by workers over a longer time. The average dehusking efficiency and kernel breakage is around 97 % and 6 %, respectively.

In order to increase the output capacity and to separate arecanut kernels from the husk, 1 hp single phase electric motor and an impeller blower was incorporated in the machine. The motor drives dehusking cylinder and also drives impeller blower with belt and pulley arrangement. The output of this machine is in the form of arecanut kernels separated from husk.

### **Specifications of the dehusker**

Capacity:

Pedal operated dehusker = 12-15 kg/h (dried whole arecanut)

Power operated arecanut dehusker = 30 - 35 kg/h (dried whole arecanut)

Weight:

Pedal operated arecanut dehusker = 110 kg

Power operated arecanut dehusker = 145 kg

Overall Dimensions:

Pedal operated arecanut dehusker = 1040 x 890 x 1320 mm

Power operated arecanut dehusker = 1320 x 970 x 1600 mm

Material of Make: Mild steel

Current cost of one unit:

Pedal operated dehusker = Rs. 25,000/-

Power operated arecanut dehusker = Rs. 40,000/-



**Pedal operated arecanutdehusker**



**Power operated arecanutdehusker**



### **Manually operated arecanut scarifier**

Manually operated arecanut scarifier was developed by Dr. Balasaheb SawantKonkan Krishi Vidyapeeth, Dapoli, Maharashtra. This machine is used to scarify the outer shell of the freshly harvested arecanut fruits in order to enhance the moisture removal rate and thereby to facilitate early drying. It consists of the hopper, inner drum with pricks and conveying arrangement, perforated outer drum and handle. The outer drum is kept stationary and the inner drum is rotated by the operator using handle provided on the machine. The pricks fitted on the periphery of internal drum scarify the outer shell of the arecanut superficially without making any damage to the nuts. The mean working heart rate for women workers is found to be around 118 beats/min. While operating this machine the operator has to feed the arecanuts into the machine and simultaneously crank the handle.

This machine is also available with geared motor (1hp).

#### **Specifications of the scarifier**

Capacity : 32 kg/h

Weight : 35.5 kg

Overall Dimensions (mm) : 810 x 470 x 1200

Material of Make : Mild Steel

Current cost of one unit :Rs. 20,000/- (with geared motor)





### **Hand protection devices (gloves) to be used during fish dressing**

Hand protection devices (gloves) to be used during fish dressing has been recommended by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra for increasing work output with safety for hands. In fish processing industries the workers are engaged in fish dressing during pre-processing process. During this work, they use small sharp knife and while doing this, their hands come in contact with different sharp body parts of fish. Such small hand tools and manual work often expose workers to frequent minor injuries/skin infections etc., which leads to infections and very harmful in long term. In addition, low temperature of work environment and frequent contact with ice cold chlorinated water makes the workers suffer from many other morbidities including frequent respiratory irritation (frequent sneezing and/or coughing) at work, headache, bleaching of hand etc. Hence different types of hand protection gloves were selected and examined for their suitability during fish dressing. It was revealed that the combination of medical examination gloves (inside) and cotton gloves (outside) was well suited for hands for good grip, easy handling of fish during dressing and water also not come in contact with fingers and palm due to inner medical glove. The gloves serve as first line of safety to protect the hands from cold and injury.

#### **Specifications of the gloves**

Capacity: Fish dressing capacity with gloves = 42.4 kg/h and without gloves = 36.55 kg/h.

Material of Make: --Cotton and rubber.

Current cost of one unit : Cotton glove - Rs. 27/- (per pair) and  
: Surgical glove - Rs. 3.5/- (per pair)



**Sterile surgical gloves (inside)**



**Cotton gloves (outside)**

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## Dust free technology for traditional rice mill

A dust collection system was developed to capture the airborne dust in the rice mill. The feeding and sieving section of the mill was identified as major dust creating zone. The dust was captured by creating suitable air stream at feeding and sieving sections of the mill and collected in cyclone dust collector. The air stream was created by blower which was selected on the basis to get minimum air speed of 0.5 m/s in the working zones of workers. It was observed that the developed system successfully collects significant amount of dust and able to reduce dust concentration up to 58%. Further, the respirable dust concentration reduced to below 5 mg/m<sup>3</sup> throughout the mill which is within the recommended limit of dust exposure.

Capacity : -

Weight : -

Dimensions :Venturi shaped opening-Minimal and Maximal diameter: 5cm & 10cm  
Hood-100×100×80 cm(l\*b\*h)

Material of Make :Venturi shaped opening-Plastic pipe, Hood- Iron sheet

Current cost of one unit : Rs.70, 000.00

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